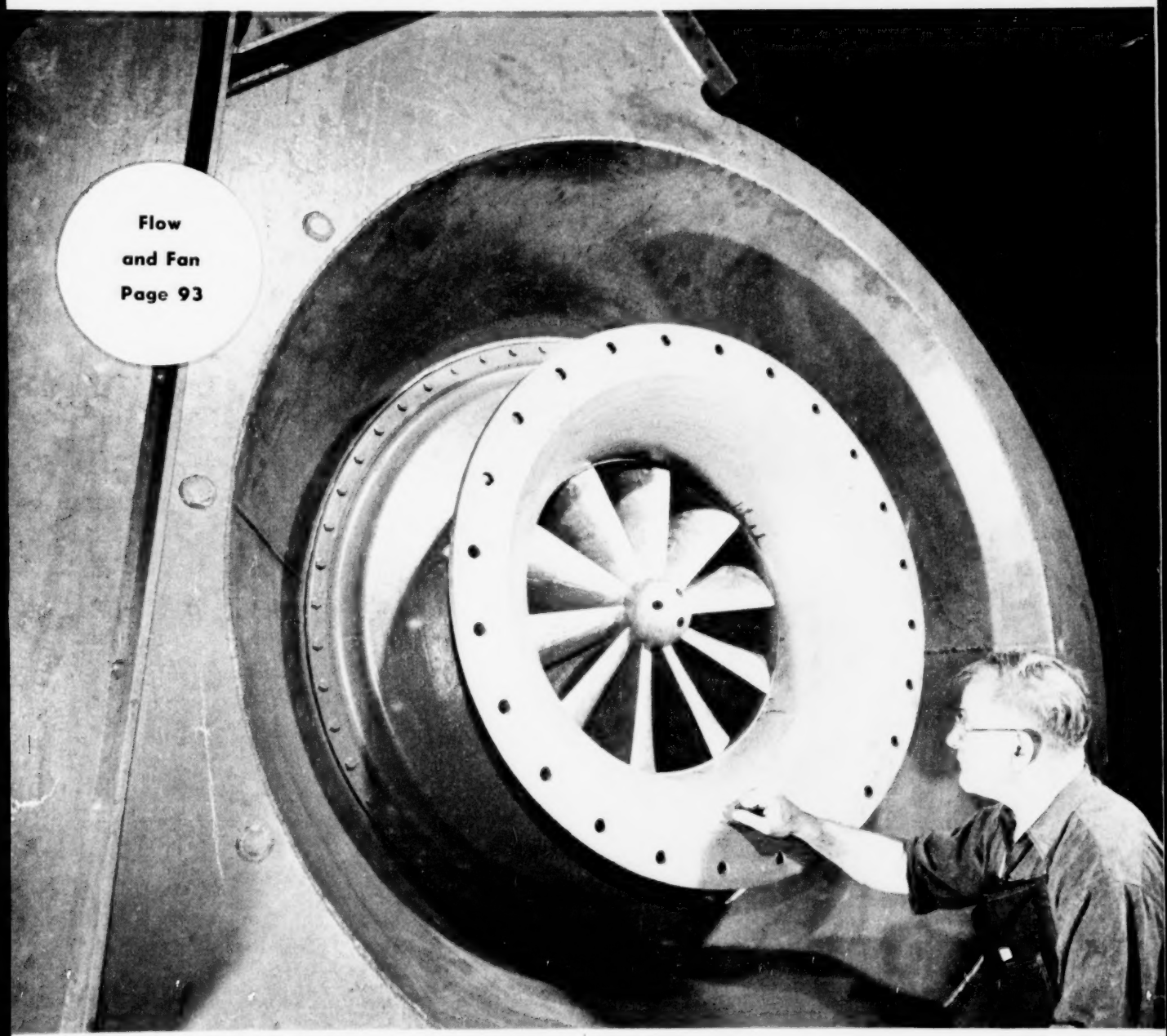
FEBRUARY, 1953

HEATING AND VENTILATING

INCLUDING AIR CONDITIONING – PIPING – REFRIGERATION – AIR SANITATION



Flow and Fan Page 93

A New Monthly Feature—

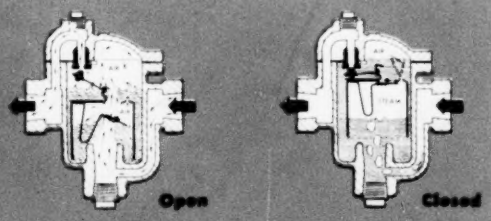
H & V's DETAIL SHEETS — See Pages 9 and 10

NO OTHER STEAM TRAP

gives you all these features for Low Pressure Heating Service!

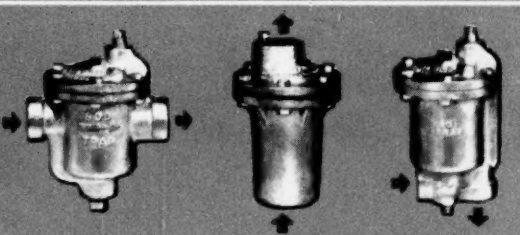
1. QUICK HEATING

Use of a "blast" bucket with auxiliary thermic vent gives maximum air-handling capacity. Air and water blow straight through until steam closes vent.



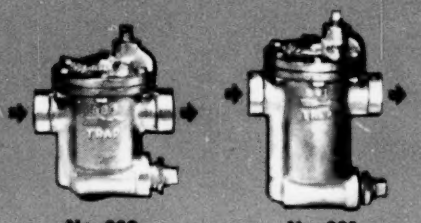
2. EASY INSTALLATION

Any pipe connection—horizontal, vertical or angle—available for the majority of installations to save time, labor and fittings.



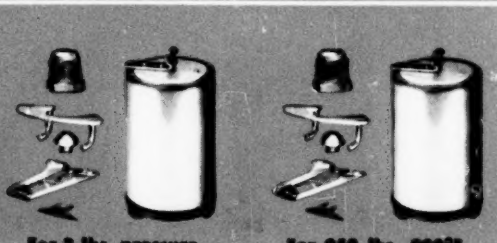
3. INTEGRAL STRAINER

The two most commonly used trap sizes are available with strainers built-in to the body to save time, labor and money through faster installation with fewer fittings.



4. STAINLESS MECHANISM

Valve and seat of hardened chrome steel, all other parts 18-8 stainless—*identical* to materials and workmanship used in traps for 950 lbs., 900°F.



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Self-scrubbing... Non Air Binding... Immune to Corrosion.

Traps and Parts in Stock in Over 100 Cities. Call your nearby Armstrong Representative or Jobber Today.

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846 Maple Street, Three Rivers, Michigan

Send for Catalog

—the *new* Armstrong Steam Trap Book gives complete data and prices, tells what size trap to use.

ARMSTRONG STEAM TRAP

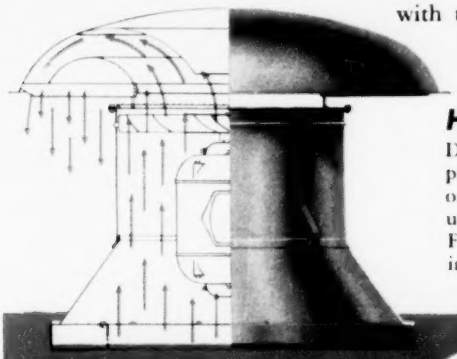
ARMSTRONG STEAM TRAPS

(Photo courtesy of National Biscuit Company)

Smart Cookies (LIKE NABISCO) CALL FOR Controlled Ventilation

At Portland, Oregon, the modern National Biscuit Company plant is one of the most scientifically equipped food producing establishments in the world. But you can imagine how hot it could get around ovens that turn out several million cookies a day! Plant designers Ford, Bacon and Davis anticipated the need for exhausting hot air caused by baking processes, and came up with the right recipe. 42 DeBothezat Power-Flow Roof Ventilators, each with 21" fan wheel and 1 HP totally enclosed air-over motor, were installed over the oven area. 19 Power-Flows with 27" fan wheel and 1 HP motor were installed above the packaging and shipping areas. Altogether these 61 Power-Flow Roof Ventilators exhaust more than 445,000 cubic feet of air per minute. Controlled ventilation assures good working conditions, and is in keeping with the high standards of NABISCO operation and sanitation.

Certified Ratings



HOW ABOUT YOUR PLANT?

DeBothezat Power-Flow Roof Ventilator is a motor-driven fan in a weatherproof housing, for use with or without duct systems, either for air exhaust or intake. Available with fan wheels 12" through 48" in diameter, delivering up to 40,900 CFM. Low, streamlined design blends well with all architecture. For catalog containing illustrations, specifications and certified capacity ratings, write our factory, Dept. HV-253, or phone your local DeBothezat agent.

Power-Flow ROOF VENTILATORS

Built by **DeBothezat Fans**

Division of American Machine and Metals, Inc.
EAST MOLINE, ILLINOIS

"Mile High" Warm as Toast

Santa Anita Hospital, Lake Arrowhead, California. Built 1951. Operated by the Sisters of St. Joseph. Architect: Roland E. Coate, F.A.I.A., San Marino. Consulting Engineers: Hilburg, Byler & Hengstler, Los Angeles. Heating Contractor: Hansen Plumbing Co., San Bernardino.

Santa Anita Hospital, high in the San Bernardino Mountains, has forced hot water Webster Tru-Perimeter Heating

Comfort is one of the principal advantages of Webster Tru-Perimeter Heating in this new hospital. There are no cold walls to reduce body temperatures because Webster Walvector spreads the heat along every outside wall.

Semi-private room (above) and operating room use Webster Walvector wall-to-wall.

Right, X-ray Department is comfortably heated despite large window areas with Webster Walvector.

Webster Walvector, arranged for perimeter heating, contributes to economy of first cost. It eliminates exposed piping. Installation is easy. Webster Walvector uses sturdy aluminum fins on copper tubing. It's rapidly warmed. It is also possible to reduce heating quickly when occupancy is ended.

You can use Webster Walvector in new buildings or modernization . . . as individual convectors or arranged for perimeter heating. Complete technical data is available in Bulletin B-1551. Get in touch with your Webster Representative or write us.

Address Dept. HV-2

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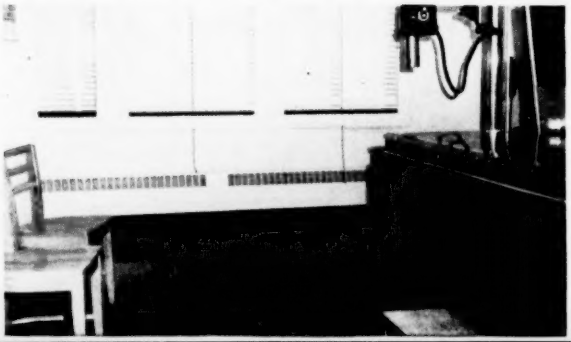
REG. U. S. PAT. OFF.
For Steam or Hot Water Heating



HEATING AND VENTILATING

A MONTHLY MAGAZINE FOR ENGINEERS AND CONTRACTORS CONCERNED WITH THE DESIGN AND APPLICATION OF AIR CONDITIONING, REFRIGERATION, PIPING, AIR SANITATION, HEATING AND VENTILATION IN BUILDINGS

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Also Publishers of
HEATING & PLUMBING EQUIPMENT NEWS
and technical books.

THIS MONTH'S COVER

Giant blower constructed at Sturtevant Division of Westinghouse can drive 36,000 cfm of gas through utility mains at distribution pressure. Wheel is turned at 2,860 rpm by 600-hp steam turbine.

Washington News

LORING F. OVERMAN

IF THE new Administration can stir up a legislative program as enthusiastically received as was the inaugural celebration in Washington, the period ahead should be interesting, entertaining and profitable.

The largest crowd ever to attend an inaugural was on hand to welcome President Dwight Eisenhower, the parade which followed the ceremonies was the most extensive staged at the Capital, and all other induction functions set records for attendance, brilliance, and good will.

It remains to be seen whether the harmonies of the introduction will carry over into the trying times ahead. Observers are saying that only the late Franklin D. Roosevelt inspired such unanimity of approval as that accorded Eisenhower. But others are saying that the honeymoon will last only until the post-election courtesies bump into political expediency. Typical of things which are possible was the dramatic one-man roadblock erected by Oregon's Senator Morse to stymie temporarily the confirmation of the new Cabinet. True, it was only a delaying action, but an embarassing one (to the incoming Administration) nevertheless.

The Road Ahead

Because so much depends, policywise, on what the new President has in mind along military lines, it may be some time before the true pattern of the road ahead becomes apparent. No matter how much the new President may wish to share with Congress and with his people the details of his military planning, the need for secrecy makes complete frankness a threat to national security.

As the new President took office, most Washington observers conceded that economic controls (prices and wages) would be terminated promptly. Control over prices of a few basic metals was considered a possibility, and there was general agreement that some form of allocation of scarce materials, to assure deliveries for defense needs, would be authorized.

Decisions involving expanded production goals were being postponed pending clarification of military requirements. Two things were noted. The President was continuing to speak hopefully of cutting the budget to 70 billion dollars (from Mr. Truman's $79 billion version). But Mr. Eisenhower also commented in his inaugural address, that "A soldier's pack is lighter than a prisoner's chains"—leaving no doubt that military needs must receive high priority.

The question of expanding steel finishing facilities still further, *for example*, appeared to revolve around a few types of end products—primarily those having little or no value in a civilian economy. The new Administration was expected to act quickly on this subject, after investigating charges that much of the recent expansion in the steel-finishing industry has been to enlarge facilities for civilian products. More recently, however, industry has added facilities to finish some of the heavier shapes and forms needed in armament.

Straw in the Wind

Regardless of the outcome of budget discussions, tax studies and controls, it is encouraging to note that one of the first bills introduced for consideration by the new Congress had to do with possible elimination of overlapping functions and fiscal relationships. A bill to set up a temporary National Commission on Intergovernmental Relations has been introduced by Senator Robert C. Hendrickson (R-NJ). He told the Senate that his proposal favored "doing what could be done to stem the tide toward further and further concentration of authority in the hands of the Federal Government in Washington."

Basis for Commission

Purposes of the commission, according to Senator Hendrickson, would include:

(1) To find ways of establishing a "less competitive fiscal relationship between the several layers of government." This would include "overlapping and confused systems of taxation" and grants-in-aid programs.

(2) Elimination of duplication and overlapping services, activities and functions among the three governmental levels.

(3) Reduction in government spending to a low level consistent with efficient governmental performance.

The study, which was urged by the Hoover Commission as well as the state and local governments, would "point up the need for some central clearing house for all kinds of information dealing with state and local government, law, and administration," Senator Hendrickson explained.

Other "Mosts"

With the proposed intergovernmental study as one of the "most encouraging" items out of the new Congress, there were also other "mosts" in Washington.

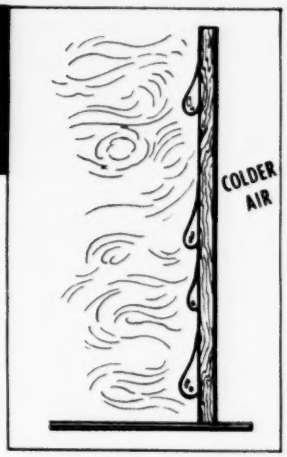
"Most frightening" was the establishment within the Office of Defense Mobilization, of a new position—Director for Post-Attack Production Planning. Function of the office, it was explained, is to advise the ODM on problems relating to the continuance of essential industrial operations in the event of enemy attack, and to coordinate with the nation's industry the activities of all Federal agencies engaged in planning for production after enemy attack.

"Most stimulating" was the suggestion of the National Science Foundation that more attention be paid to basic research in the sciences, rather than stressing research aimed at specific programs and goals. The Foundation's second annual report, points out that national security, as well as future well-being of the nation may depend upon shifting the emphasis to basic research rather than to things specific.

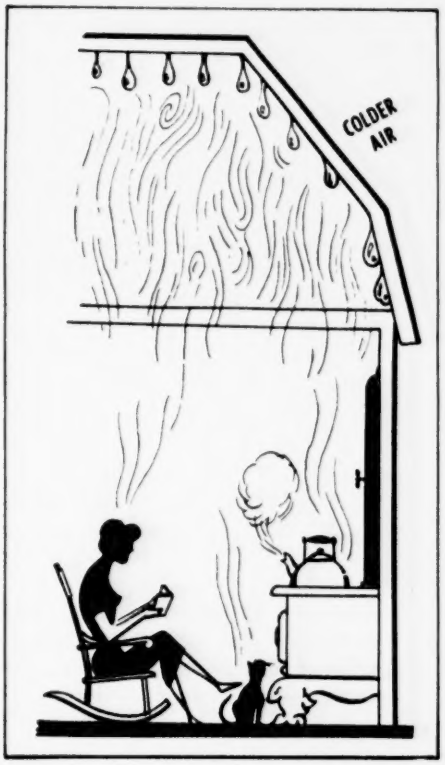
"Most important" in the event of hostilities, is the program readied by the National Security Resources Board. NSRB has the task of planning policies which

How to Stop CONDENSATION!

Prevent Damage to Wood, Plaster, Paint, etc.



Condensation forms when temperature of contacting air is reduced below dew-point by a cold surface.



Condensation forms when the capacity of an air space at a given temperature is too small for the amount of vapor present. →

As air grows colder, it can hold less vapor. Saturation increases until a dew-point is reached, and condensation occurs. The surface of a material colder than the contacting air it faces, and continuously losing heat on the other side, will continuously extract heat from the air by direct conduction. The denser and bulkier the material, the more heat will it extract and store before attaining room temperature, if it ever does.

For example, if ordinary insulation is installed with air spaces on both surfaces, it continuously absorbs and emits heat rays at a rate of over 90%. If installed without air spaces, there is even more heat flow continuously by direct conduction through solids. Each square foot contains about 363,314 fibers, with surfaces aggregating approximately 46 sq. ft. for possible condensation formation.

With multiple sheets of accordion aluminum, the sheet nearest the warm room weighs only ¼ oz. per sq. ft., absorbs and radiates only 3% heat; thus extracts and stores practically no heat from the air, only enough to attain and remain at room temperature. The additional reflective air spaces on the other side are insignificant heat conductors. The other sheets of aluminum and fiber block convection heat losses to the "cold" side.

No condensation forms on the aluminum surface next to the warm room, for a dew point is never reached. The sheet's other surface faces a space which is a *little* colder than the aluminum. Since warmth flows to cold in radiation and conduction, the aluminum will *give off a slight* amount of *heat* to the colder space, thereby slightly *increasing* its vapor retaining capacity; which prevents condensation.

The next reflective space has almost the same temperature as the next aluminum surface, with its slight mass, 1/5 oz. per sq. ft. The aluminum absorbs and emits little heat. Its other surface is slightly warmer than the air it faces; again there is no extraction of heat (the REVERSE), so no dew point.

With 4 or 6 reflective spaces, there can be no dew point anywhere on or in such aluminum insulation. If rain leaks in, it will be slowly expelled as vapor, since exterior walls, compared to aluminum have far greater permeability than the required minimum 1 to 5 ratio. Aluminum is impervious to vapor flow, so condensation on under surfaces of roofs and inner surfaces of outer walls is minimized.

THERMAL FACTORS, TYPE 6 INFRA

Up-Heat C.089, R11.23 equals 4⅜" DRY Rockwool
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would become effective overnight in wartime. Such a program was in the discussion stage at the time of the Korean outbreak, but details were not completed. This time it will be different, says a current report of NSRB.

Emergency Powers

Over the past few years the National Security Resources Board has prepared approximately 20 titles of proposed emergency powers legislation which would be needed by the Chief Executive in the event of war or full mobilization. Much of this proposed legislation has been embodied in the Defense Production Act of 1952. Other suggestions which the NSRB believes would assist in getting the nation in uniform quickly are listed and ready for action should the need arise.

Washington Miscellany

Synthetic Fuels Plant Proposed. Senate Bill 6, dropped into the hopper by Senator Pat McCarran, Nevada Democrat, would authorize the Reconstruction Finance Corporation to work with the Department of the Interior in financing a privately-operated, commercial scale synthetic liquid fuel plant. The project will also subsidize further research and development of such fuels from oil and shale.

The commercial plant proposed in the bill would produce at least 5,000 barrels of liquid fuels per day. The bill also provides for establishment of an industry advisory committee, authorizes RFC to build, lease, purchase or expand synthetic fuel plants; authorizes the Interior department to create reservations of oil, shale and coal on public lands; provides for annual progress reports of the agencies involved, and makes exemptions from the antitrust laws for plants operating in conformance with provisions of the bill.

Bringhurst Heads Coke Division. H. M. Bringhurst, Detroit, has been named to head the Coke division of the Defense Solid Fuels Administration. He succeeds George P. Wilson Jr., who has returned to his position as executive assistant to the general manager of the Engineering and Construction Division of Koppers Company, Inc., Philadelphia. Mr. Bringhurst has been assistant director of the DSFA Coke division since November, 1951.

Oil-Goods Black Marketing Reported. The Petroleum Administration for Defense is cracking down on alleged violations of its rulings limiting deliveries of scarce oil-country casing and tubing. Fifteen persons and three firms have been named in reports filed with the Justice Department.

"Oil-country tubular goods are still in critically short supply," said Deputy Petroleum Administrator J. Ed Warren in commenting on the alleged violations. The lack of such goods has been an important factor in limiting the drilling of new wells and consequently in building the reserve capacity we would need in the event of war.

"It is imperative that the orders which insure an equitable distribution of the available pipe be followed closely. Our investigations of reported violations are continuing and will be pushed relentlessly."

Tubular Heat Exchanger Goal Reduced. A downward revision in the expansion goal for the tubular heat exchanger industry—based on a re-evaluation of supply and requirements—has been announced by the Defense Production Administration.

The new goal contemplates an annual production capacity of 53,500,000 sq ft of heat exchanger surface by January 1, 1954. The previous goal, announced last August, was set at 38,500,000 sq ft. The revised goal represents a gain of 15,000,000 sq ft of exchanger surface over the reported January 1, 1951 capacity of 38,500,000 sq ft.

Certificates of necessity have been issued for rapid tax amortization of approximately 7,200,000 sq ft of new capacity annually, and about 5,770,000 sq ft of expansion is being provided by industry with rapid tax write-off added. This makes a total of 12,970,000 sq ft of capacity under way, compared with the present goal of 15,000,000 sq ft contemplated.

Defense Buying

DPA reports that more than 90 percent of current tubular heat exchanger production is going to the direct military and defense supporting programs, with petroleum refining, chemical and power industries as the principal users. Highly engineered heat exchangers are produced for the Atomic Energy Commission, Navy and petroleum and chemical industries. Heat exchangers for the power industry include feed water heaters for stationary and marine use, coolers for turbine bearing coils, coolers for forced draft blower bearings, coolers for generator hydraulic drives, and forced draft fans.

PAD Appoints Three. New heads of three divisions have been named by the Petroleum Administration for Defense. R. Rea Jackson, New York City, will head the Refining Division; Richard E. Nelson Jr., Glencoe, Ill., will direct the Supply and Transportation Division, and Paul E. Kuhl, Pelham Manor, N. Y., will become director of the Foreign Refining Division.

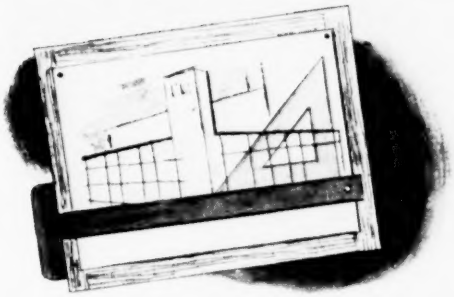
Cast Iron Plumbing Fixture Prices. Unwilling to concede the possible demise of price controls, OPS on January 11 authorized producers of enameled plumbing fixtures to raise their ceilings by about 1.85% under the industry earning standard. These manufacturers were rolled back to 95% of their GCPR ceilings in an order issued on May 15, 1952, and the earnings standard increase restores a part of this amount. The earnings survey was authorized after the industry complained that it was entitled to higher ceilings under the earnings standard. Starting January 17, the industry was permitted to fix its prices at 96.75% of its GCPR ceilings.

Copper Supply Remains Tight. Those who depend upon copper must continue to face the likelihood of short supply, the National Production Authority warns. NPA said that demand for copper is still greater than forseeable supply, with no immediate relief in sight.

Cressman Heads NPA Iron-Steel. William L. Cressman now heads the NPA iron and steel division, succeeding John E. Timberlake, who has returned to Jones & Laughlin. Mr. Cressman has been with NPA since October, on loan from Armco Steel, where he is manager of eastern sales.

BRUNNER
SINCE 1906

DESIGNED FOR YOUR AIR CONDITIONING REQUIREMENTS



For the many installations where efficiency and economy must be combined with application flexibility—these new "packaged" BRUNNER AIR CONDITIONERS are the answer! Precision-built, powered by the famous Brunner quiet slow-speed compressors—these self-contained units permit complete freedom of application planning for every type of job. Easy to install anywhere—and, like all Brunner products, they are engineered for fast, simple servicing *in the field*.

15 models to choose from—for within room-circulating or remote duct operation. Attractive enamel cabinets clean easily—blend into any decorative plan. A FIVE YEAR WARRANTY on the Brunner Compressor in every unit assures satisfactory service. See these BRUNNER Air Conditioners... see how they can fit *profitably* into *your* air conditioning picture...

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Dept. K-23, Utica, New York, U.S.A.

3 STYLES ... 5 SIZES

Brunner Air Conditioners are available in 3 styles (shown above)—each style in 2, 3, 5, 7½ and 10 H.P. sizes. Complete information, specifications and ratings sent upon request.

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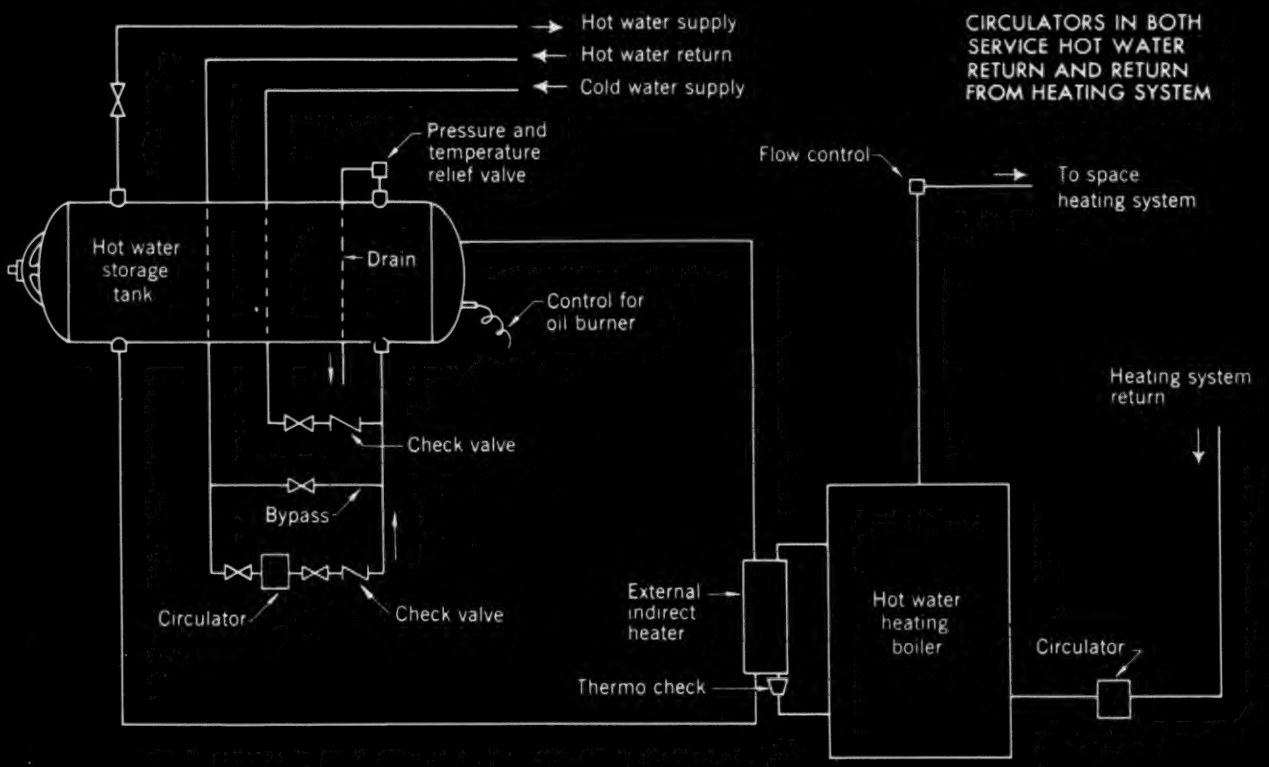
REPRESENTATIVES IN PRINCIPAL CITIES

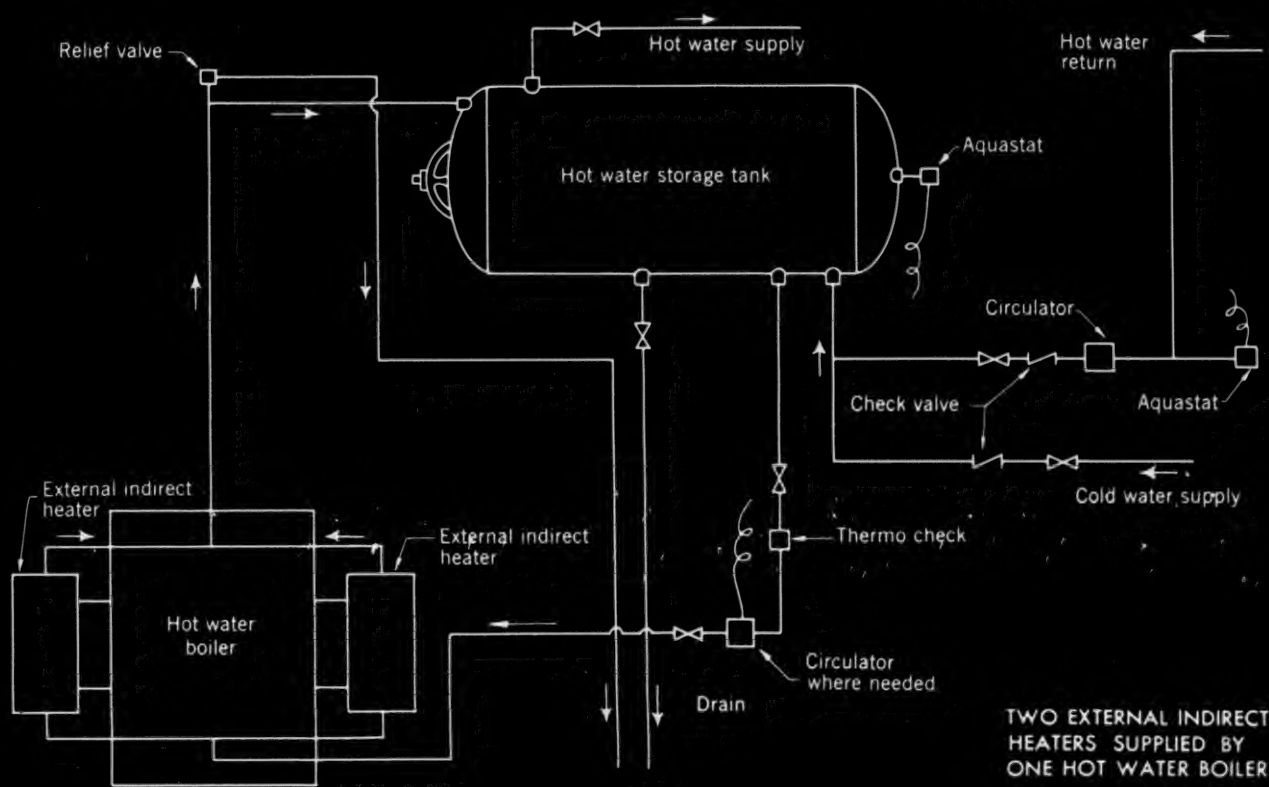
"No Air Conditioning System Is Better Than Its Air Distribution"

HEATING AND VENTILATING'S DETAIL SHEET

SERVICE HOT WATER PIPING

WITH HOT WATER AS SOURCE OF HEAT

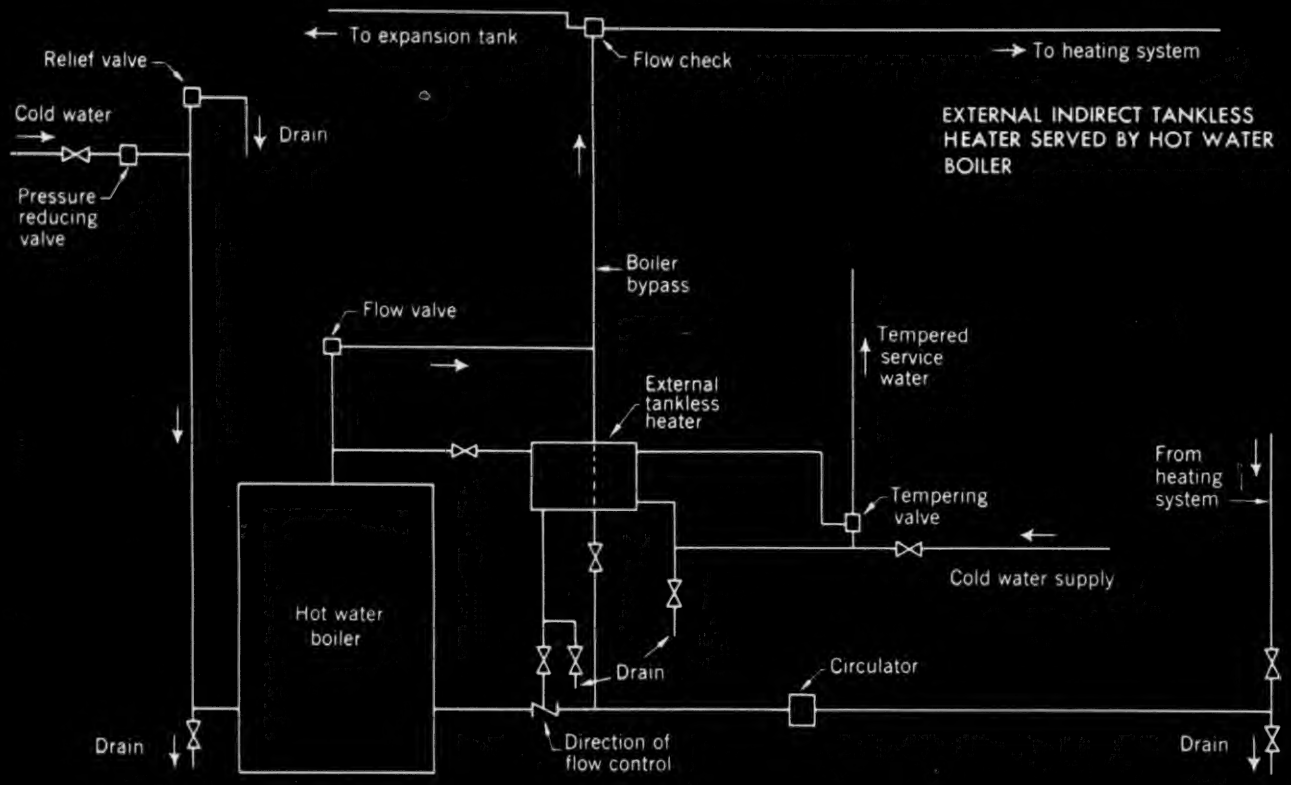


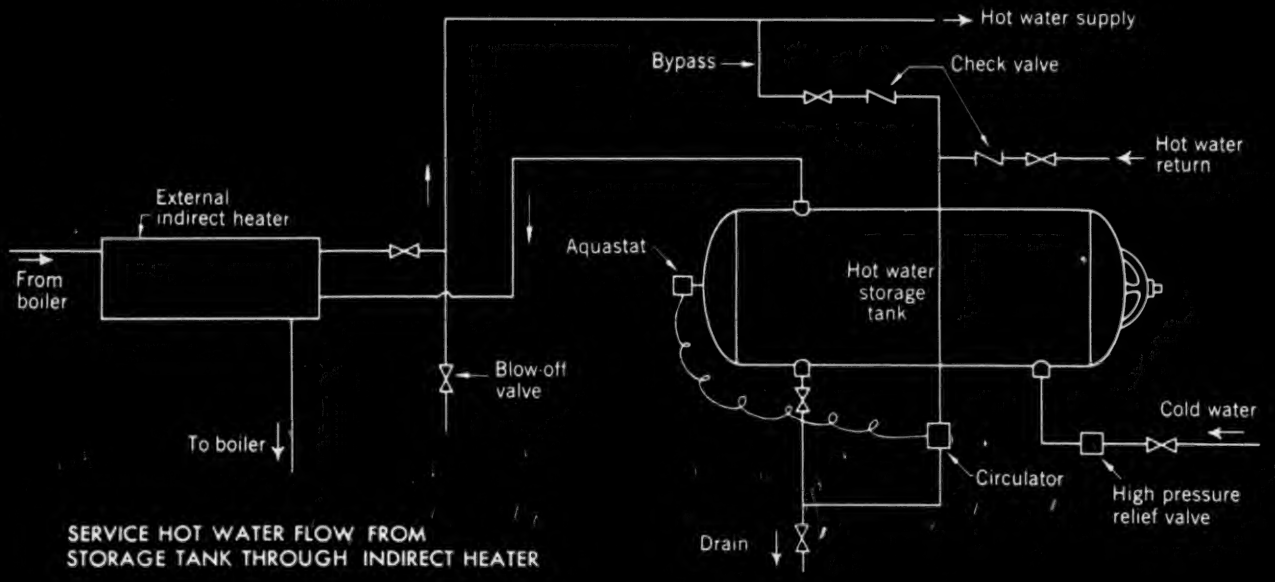


HEATING AND VENTILATING'S DETAIL SHEET

SERVICE HOT WATER PIPING

WITH HOT WATER AS SOURCE OF HEAT





SERVICE HOT WATER FLOW FROM STORAGE TANK THROUGH INDIRECT HEATER

PIPING HOOKUPS THROUGH THE COOPERATION OF BELL & GOSSETT CO., MORTON GROVE, ILL.; SYSKA & HENNESY, INC., NEW YORK, N .Y.; TACO HEATERS, INC., PROVIDENCE, R. I.; VOORHEES WALKER FOLEY & SMITH NEW YORK, N .Y.

CHIEF ENGINEER tells *why*

"we won't accept substitutes"

"...For thirty-one years, we have been using Sarco type H radiator traps, radiator valves, float-thermostatic steam traps, etc., in the Northern Hotel, which now has 300 rooms.

Over 1,281 Sarco type H radiator traps have been in service since the hotel was rebuilt in 1941.

During the ten years to date, we have replaced not more than a half-dozen elements.

That's why we again ordered Sarco heating specialties for the 1951 addition of sixty-three rooms. We won't accept substitutes.

William Hillner

WILLIAM HILLNER
Chief Engineer"

NORTHERN HOTEL, Billings, Montana, exclusively equipped with Sarco radiator traps, inlet valves and other heating specialties.

Heating contractor, Christensen Plumbing and Heating Co. of Billings, secured the Sarco specialties thru Crane Co.

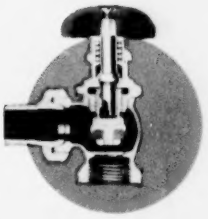
Holabird & Root & Burgee of Chicago were the original Architects and on the recent 63 room addition Orr Pickering and Associates were the Architects. J. C. Boespflug Construction Company of Billings, Montana, were the General Contractors on the original hotel building, as well as the addition.

EVERY DAY, more engineers, architects and owners specify Sarco Heating Specialties because:

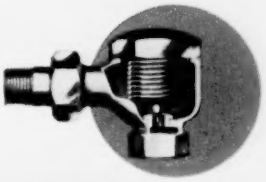
1. they are nationally known and preferred.
2. they have earned a reputation for giving years of trouble-free service.
3. the line is complete.

If you want silent, efficient and trouble-free service over a long period of years, specify SARCO.

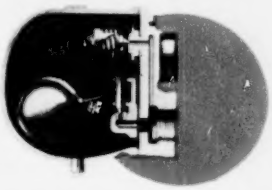
Write for Catalog 150-6, 350-5 and 450-9.



Sarco Radiator Valve No. 1141.



Sarco Radiator Trap, type H. Made with the famous Sarco Bellows; seamless, heavy wall, helically corrugated.



Sarco Float-Thermostatic Trap.

SARCO saves steam

sarco quality assures satisfaction

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REPRESENTED IN PRINCIPAL CITIES • SARCO CANADA, LTD., TORONTO 8, ONT.

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You can put full confidence in them!

THESE McQuay REPRESENTATIVES

No. 1 in a series of 3 advertisements

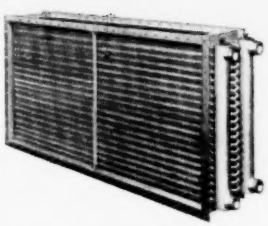
McQuay INC.

MAKE THE SEASONS COME TO YOU

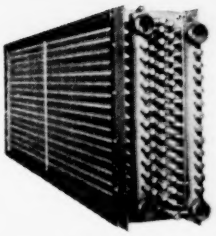
HEATING
REFRIGERATION
AIR CONDITIONING

1619 Broadway St. N. E., Minneapolis 13, Minnesota

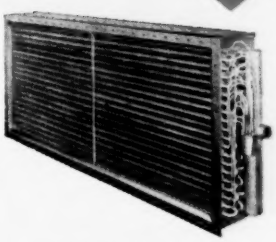
THIS COMPLETE LINE OF FAMOUS McQuay PRODUCTS



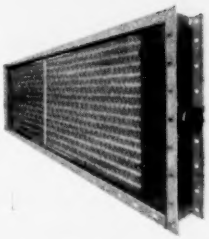
WATER COIL



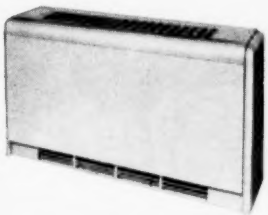
CLEANABLE TUBE WATER COIL



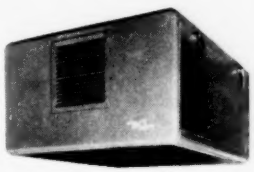
DIRECT EXPANSION COIL



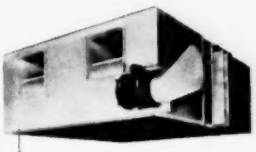
"BLAST" HEATING STEAM COIL



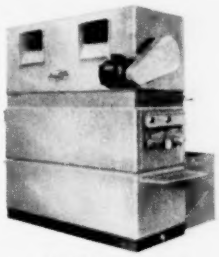
SEASONMAKER (FLOOR)



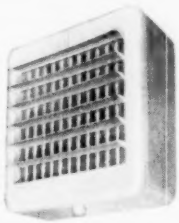
"RH" AIR CONDITIONER



AIR CONDITIONER
(Suspended Model)

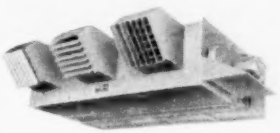


AIR CONDITIONER
(Floor Model)

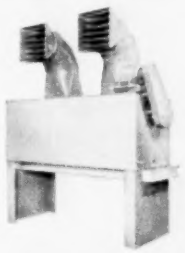


HORIZONTAL UNIT HEATER

DOWN FLOW UNIT HEATER

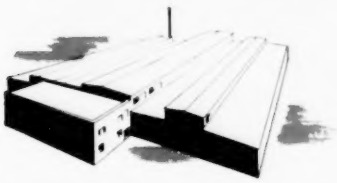


BLOWER TYPE UNIT HEATER
(Suspended Model)



BLOWER TYPE UNIT HEATER
(Floor Model)

McQuay representatives, in all principal cities throughout the United States, are qualified by long experience and training to help you satisfy all of your air conditioning and heating requirements. For cooperation in making the sale, technical advice, or getting the job done on time, consult the McQuay representative in your territory. Available to you through him is the complete line of McQuay products, featuring famous Ripple-Fin construction—a McQuay exclusive, assuring maximum heat transfer efficiency and dependable performance.



PLANT 1—1600 Broadway N. E.
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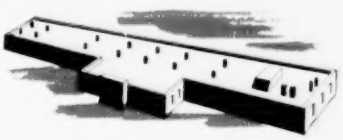

PLANT 3—4th and Park Ave.
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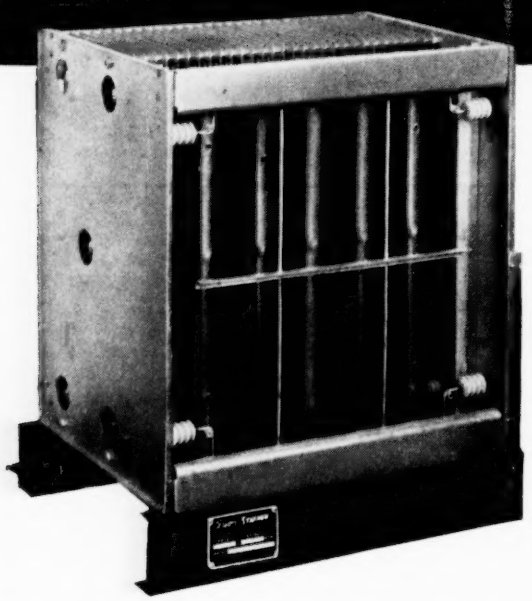
NEW! DOLLINGER Electro-Staynew PRECIPITATOR -----



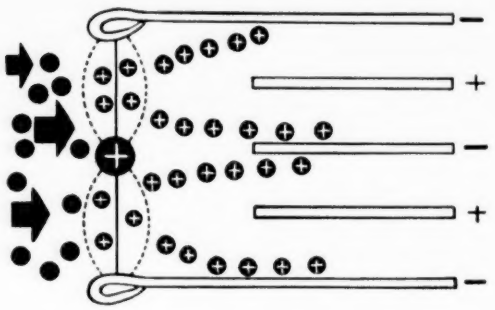
ELIMINATES SMOKE, AIRBORNE DUST AND POLLEN

IN ALL TYPES OF VENTILATING SYSTEMS

THE Electro-Staynew Precipitator is the latest addition to the complete line of Staynew Filters. More than thirty years of filter-making "know-how," and over five years of testing and improving by actual use in various installations have gone into this model.

Based upon the principle of "electrostatic precipitation," the Electro-Staynew actually charges the dust particles as they enter the unit. The particles are then attracted to and held by the negatively charged collector plates as shown in the diagram at the right.

By this method, the Electro-Staynew removes dust, smoke, soot, and microscopic particles (as small as 1/250,000 of an inch in diameter) from the air with higher efficiency and lower maintenance cost than is possible with any other type of filter. In addition, this new Electro-Staynew Precipitator has *unit* construction—ionizing and collecting chambers are in *one* compact unit.



ADVANTAGES OF UNIT CONSTRUCTION

- Simplicity of design for trouble-free operation.
- Lighter weight for ease of installation.
- Fewer parts to assemble.
- All high voltage leads from the front.
- Overhead mounting possible.
- Horizontal or vertical air flow.
- Units engineered to each job.

The simple unit construction of the Electro-Staynew gives it unusual flexibility. Combinations of the two basic cell sizes make possible complete installations of any desired capacity. This feature also saves time in assembly and greatly simplifies installation. The lightweight construction permits overhead mounting where necessary, and . . . with unit construction—all high voltage leads may be made from the front for added convenience and safety.

SEND FOR THIS BULLETIN 400 TODAY!

Electro-Staynew
PRECIPITATOR
THE LATEST DESIGN DEVELOPMENT FOR ELECTRONIC AIR CLEANING
DOLLINGER CORPORATION, 11 Centre Pk., Rochester 3, New York

New Bulletin 400 has information of interest to every engineering department. Keep it handy to answer filtration questions on industrial ventilation.

ELECTRO-STAYNEW BULLETIN CONTAINS...

- detailed diagrams on how the Electro-Staynew cleans air.
- description of all component parts.
- cutaway view of suggested installation.
- complete mechanical and electrical specifications.
- examples of fool-proof safety features.
- report of studies that prove Electro-Staynew sets new standards for economy.
- convenient chart of sizes and material list.

DOLLINGER with PROTECTO-MOTOR STAYNEW FILTERS

DOLLINGER CORPORATION

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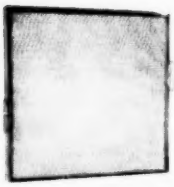
ALL TYPES OF FILTERS FOR EVERY INDUSTRIAL NEED

YOURS FREE!

Farr Company Offers a Competent Staff of Field Engineers Plus Laboratory Services to Assist You with Your Air Filtration Problems

Selection of the proper air filters to meet your exact needs is most important. For this reason, Farr Company maintains competent field and laboratory engineers who are well qualified to determine the best type of filter needed to solve your particular problem. This free service can be invaluable to you in guaranteeing complete satisfaction with your air handling system.



LATEST AIR FILTER TESTING METHODS ASSURE YOU OF PEAK PERFORMANCE

After years of research, Farr engineers have developed a radically improved method of measuring filter efficiencies that takes the guess work out of air filtration. Now, for the first time, filter performance on your job can be predetermined. This eliminates costly mistakes and needless expense. This is just one of the many money-saving services available to you *at no cost*. Write today for full information on FAR-AIR* products.

SELF-WASHING FILTERS

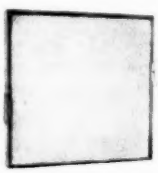
These completely automatic units are available to meet any CFM requirement. They quickly pay for themselves in greater efficiency and drastically lowered maintenance costs.

ENGINE FILTERS

Many types and sizes of engine and compressor filters are available or can be engineered to your requirements.

ROTARY COOLERS

These efficient economical units have proven highly successful under hot, low humidity climatic conditions. They are available for commercial and home use.



PANEL FILTERS

FAR-AIR panel filters are available in many types and sizes. Each design has been engineered for peak performance and substantial economy over ordinary types.

Whatever your air filtering problem is, it will pay you to mail the coupon today for expert engineering assistance. Remember, this is a FREE SERVICE!

FAR-AIR FILTERS

"Better by Farr"

FARR COMPANY

Manufacturing Engineers

Chicago • Los Angeles • New York

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Gentlemen: Send me complete information on FAR-AIR products. I would ☐ would not ☐ require engineering assistance.

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COMPANY _____

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For *Steam* Heating, too, it's Sarcotherm!

Effective control of steam heating systems for single or multiple buildings is best accomplished by continuously modulated flow of steam, proportioned automatically by outdoor temperature.

The carefully engineered SARCOSTAT SYSTEM shown diagramatically in Fig. 1 fulfills these requirements perfectly. Many are now in successful operation.

The heart of the system is the Sarcostat hydraulic-electric control valve (Fig. 1) installed in the main steam supply line to each zone and positioned by the combined effect of the outdoor temperature and the influence of steam pressure existing on the downstream side of the valve.

Successful operation is predicated on careful sizing of orifice plates in each radiator or convector, which is part of the engineering service provided by Sarcotherm.

If you are seeking trouble-free heating control of steam systems of any size or type, we shall be glad to place our experience at your disposal without obligation.

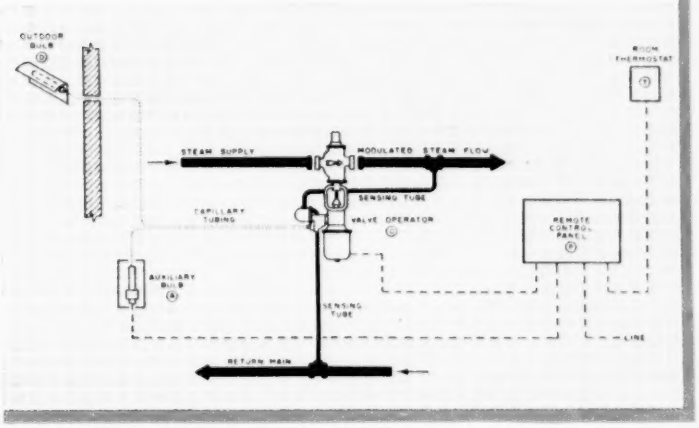


Fig. 1, Typical Hook-up of Sarcostat System.

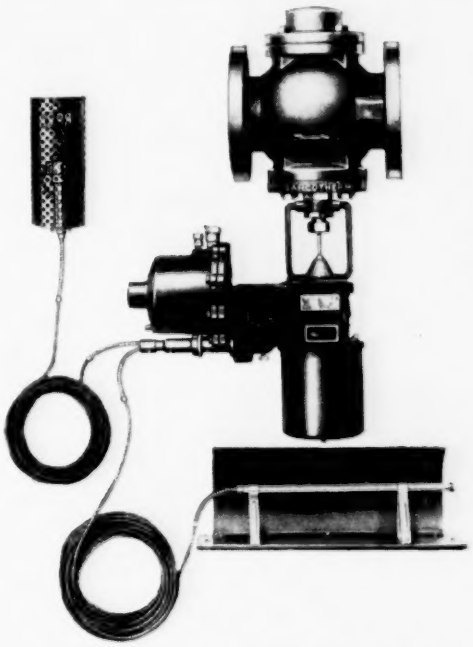


Fig. 2, Sarcostat Modulating Control Valve, Type W-1.

Fig. 3, Type W Manual remote Control Panel is equipped with temperature adjusting knob for "warmer" and "cooler," also a four-position Selector Switch for "Automatic," "Full Heat," "Heat Off," and "Summer."

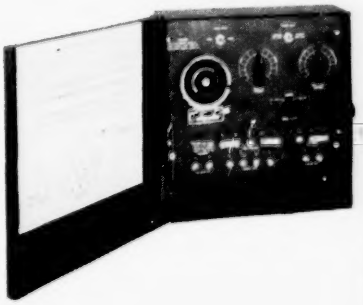


Fig. 4, Type WSA Remote Program Control Panel, adds to the features of type W a time clock to provide automatic morning pickup and night setback, and other features as specified.

Write for NEW Catalog ***ST500-2***

25

SARCOTHERM CONTROLS, INC.

Empire State Building, New York 1, N. Y.

A SARCO PRODUCT

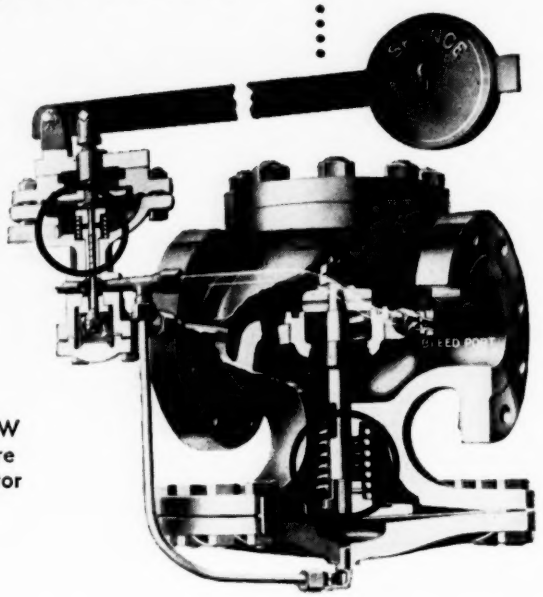
HOW SPENCE DESIGN...

...*protects springs*

FOR LONGER LIFE

In the Spence Regulator, the springs are out of the path of the steam or other fluid flowing through the valve. They operate at low unit stress for exceptionally long life. This is only one of the many Spence design features that assure dependable, accurate regulation year after year. That means less down-time, less time and money wasted on replacement of parts.

Spence makes a wide line of automatic regulating valves: Pressure, Temperature, Differential Pressure, Back Pressure, Pump Governor and many other types. Write for bulletin 100 giving full details.



Type EW Pressure Regulator

A few other design features:

SECO METAL SEATS AND DISCS—Durable SECO Metal resists wiredrawing. More than twenty years of experience in thousands of installations has failed to produce a single case where SECO Metal has been cut by steam.

LARGE BALANCED METAL DIAPHRAGM located in a cooled zone with a condensate seal above and below it, never has to be replaced under normal conditions.

PACKLESS CONSTRUCTION—All Spence main valves and most pilots are built without stuffing boxes. This minimizes friction . . . reduces valve stem wear and eliminates time-consuming maintenance.

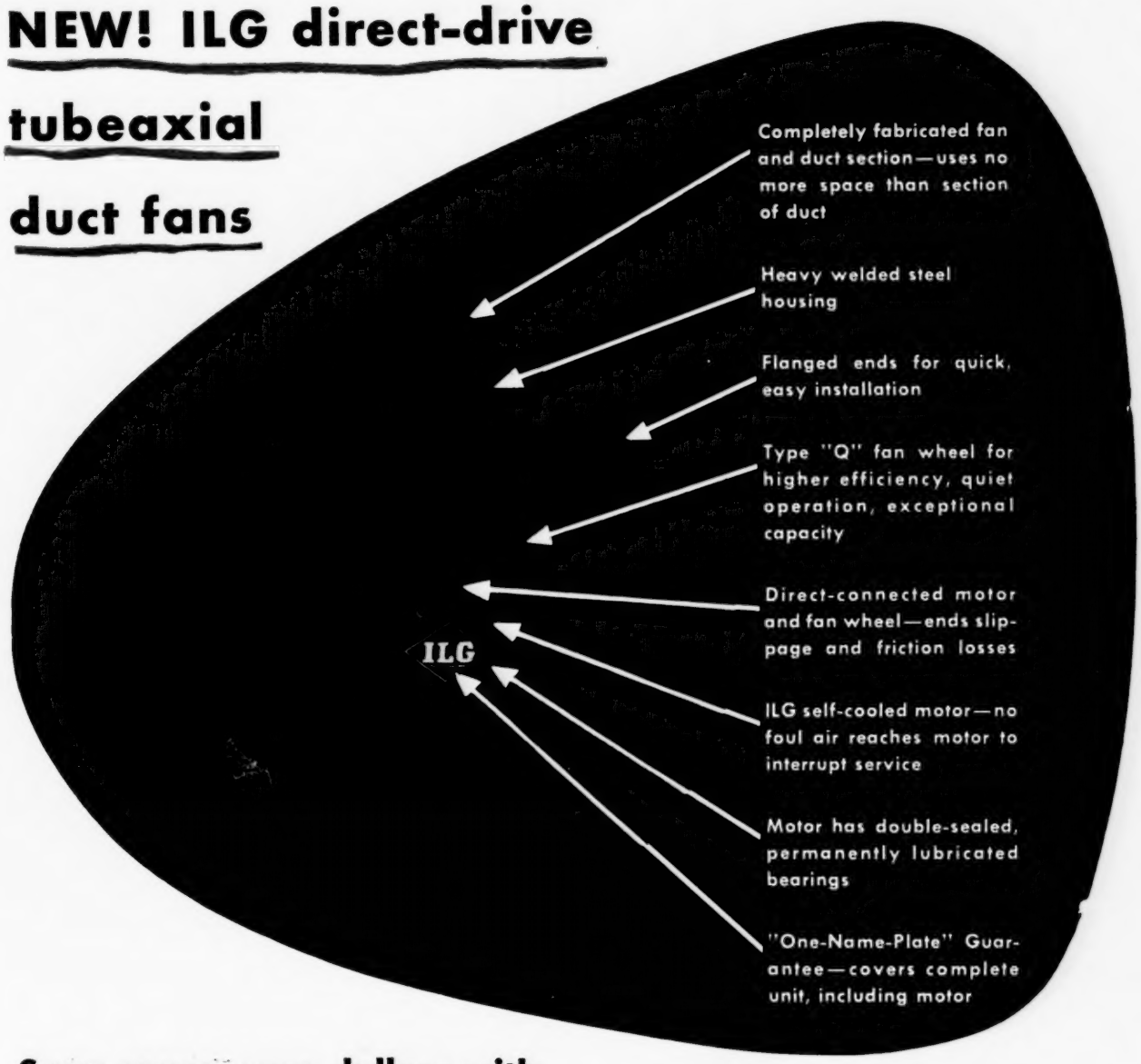
Spence

SPENCE ENGINEERING COMPANY, INC.

WALDEN, NEW YORK

SE123

NEW! ILG direct-drive tubeaxial duct fans


Completely fabricated fan and duct section—uses no more space than section of duct
Heavy welded steel housing
Flanged ends for quick, easy installation
Type "Q" fan wheel for higher efficiency, quiet operation, exceptional capacity
Direct-connected motor and fan wheel—ends slippage and friction losses
ILG self-cooled motor—no foul air reaches motor to interrupt service
Motor has double-sealed, permanently lubricated bearings
"One-Name-Plate" Guarantee—covers complete unit, including motor
ILG

Save space, save dollars with tested and proved duct fans

Now you can benefit from ILG's multi-year experience with duct fans! Here is a new line of direct-connected tubeaxial duct fans specifically designed for the low pressures common to ventilating and air conditioning service. You'll find innumerable applications for them in commercial and industrial installations. These fans give you everything you've wanted in a duct-mounted fan—quick, easy, permanent installation—all the money-saving advantages of direct-drive—the long life and economical operation of the self-cooled motor feature—the remarkably high efficiency and quiet operation of the "Q" wheel design. Get specifications and prices on the five sizes now available—send coupon or phone nearby Branch Office (consult classified directory).

ILG knows ventilation!

REG. U. S. PAT. OFF.

Free! Bulletin 15A contains complete data on new ILG Tubeaxial Duct Fans

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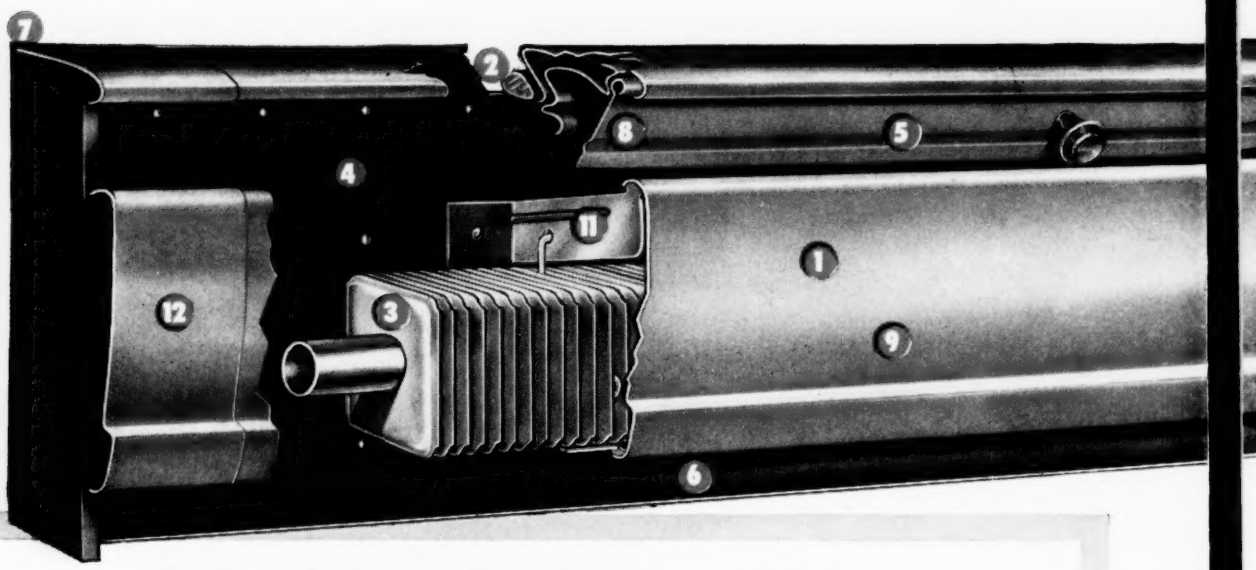
Trane introduces a new *labor-saver* Baseboard

A great new addition to the nation's No. 1 line of



Installs easier because it's built better . . . 12 ways

1. **Snap-on front** . . . no metal screws, no metal drilling
2. **Full-length back-to-wall rubber seal** . . . to prevent streaks
3. **Famous TRANE fin-and-tube** . . . copper tube, aluminum fin, mechanically bonded
4. **One-piece back and top** . . . minimum parts quickly installed, mounting holes provided
5. **Uninterrupted outlet** . . . blends unit into room
6. **Reverse radius at bottom** . . . eliminates quarter round, speeds installation
7. **Universal unit** . . . free-standing or semi-recessed . . . 2 heights, 2 capacities
8. **Snap-in damper** . . . no screws, hinges, levers or chains
9. **All parts roll and die formed** . . . to assure quick, accurate assembly
10. **Snap-on joiner pieces** . . . fit tight, completely cover joints
11. **Coil hanger** . . . allows free expansion, ends noise
12. **End caps** . . . feature snap-on fronts for easy accessibility

You can save labor and shave costs with this

beautiful new TRANE

Convector

modern radiation.

1

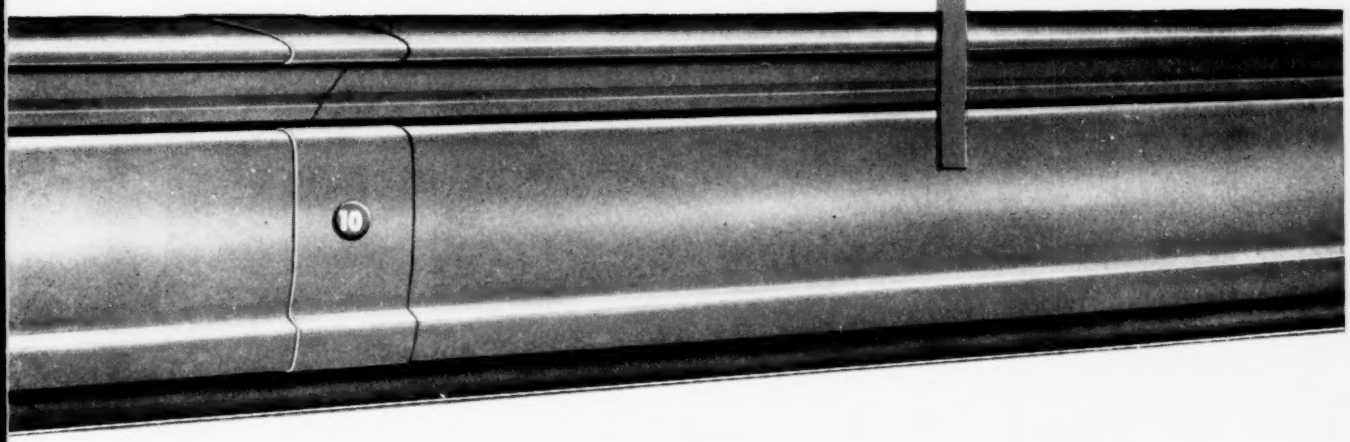
Cuts handling time 1/3

Contains fewer parts . . . arrives assembled with element mounted in cabinet. It's far easier to handle. There are no parts to sort.

2

Cuts installation time 1/2

Fit . . . connect . . . snap together. No sheet metal screws. No sheet metal drilling. No leveling. No complicated fitting.



Saves hours on the job . . . here's why:

1. Remove assembly from package!

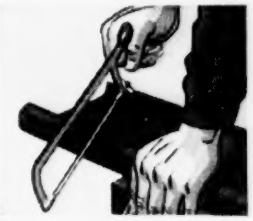
Basic Baseboard Convector unit arrives *assembled* . . . in *one* package. Just slip it out. No sorting of parts. No complications.

2. Mount one-piece back plate!

Mounting holes are factory drilled (on 1½" centers). Hanger holes are pre-punched. No leveling, no sheet metal drilling.

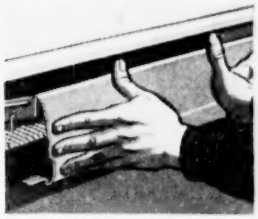
3. Only two cabinet parts to trim!

A simple on-the-job operation. No complicated fitting. Only two parts . . . easily tailored to fit the job dimensions.



4. Snap on front, joiners, corners!

Snap-on joiners, corners, end pieces cover all metal edges. No special tools, no sheet metal screws. Damper snaps in.



MAIL THIS COUPON TODAY

Baseboard Convector

The Trane Company, La Crosse, Wis. • East. Mfg. Div., Scranton, Penn.
Trane Co. of Canada, Ltd., Toronto • 80 U.S. and 14 Canadian Offices

The Trane Company, La Crosse, Wisconsin

I would like an *advance look* at the details of the new TRANE Baseboard Convector. Please send me your FREE bulletin.

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ADDRESS_____

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Carrier self-contained WEATHERMAKER equipped with ALLEN-BRADLEY TROUBLE FREE MOTOR CONTROLS

Why are Allen-Bradley automatic starters so popular for refrigeration and air-conditioning service? . . . Because they are trouble free. Only ONE moving part. No pivots, pins, or bearings to corrode or stick . . . no jumpers to break. You install them . . . and forget them!

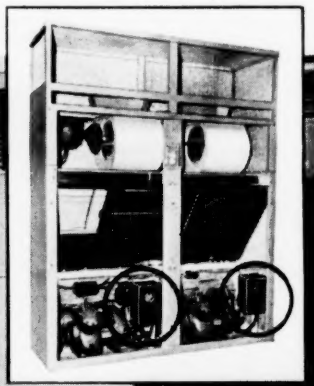
No contact maintenance . . . Allen-Bradley cadmium silver alloy contacts never need cleaning, filing, or dressing.

Dependable overload relays . . . Allen-Bradley thermal relays are accurate and always dependable . . . even after long service.

The Allen-Bradley trademark stands for millions of trouble free operations.

Allen-Bradley Co., 1330 S. Second St., Milwaukee 4, Wis.

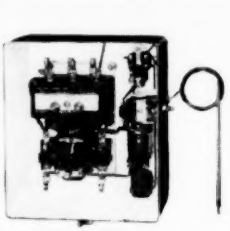
Close-up of interior of Carrier Weathermaker, showing the three reliable, trouble free Allen-Bradley Controls.



Carrier self-contained Weathermaker, equipped with Allen-Bradley Controls, installed in an egg storage plant. Simplicity of design is the key to the leadership position of Allen-Bradley Controls.

ALLEN-BRADLEY SPECIAL REFRIGERATION CONTROL UNITS

Allen-Bradley offers a wide line of air-conditioning and refrigeration controls—pressure and temperature controls, manual and automatic starters, and special refrigeration control units. The two units at the right show Allen-Bradley special refrigeration control units consisting of solenoid starter, high pressure cutout, thermostat, and manual starting switch. A-B Controls are trouble free.



Bulletin 709 Size 2 Starter Unit

Bulletin 709 Size 1 Starter Unit

ALLEN-BRADLEY SOLENOID MOTOR CONTROLS

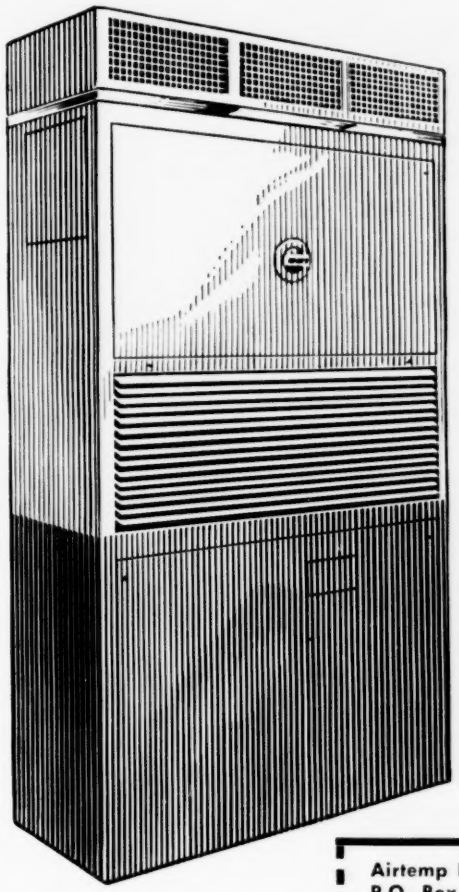
WHY CHRYSLER AIRTEMP IS STILL THE LEADER IN "PACKAGED" AIR CONDITIONERS

There are many reasons why Chrysler Airtemp sells more "Packaged" Air Conditioners. One very important reason is the nationally advertised and respected Chrysler Airtemp *name*.

This name is your customer's guarantee as well as yours, of PROVEN DEPENDABILITY. Chrysler Airtemp pioneered the "Packaged" Air Conditioner with the high speed sealed compressor fifteen years ago. All the engineering know-how and improvements developed over this period of years are *yours* . . . when you sell Chrysler Airtemp.

This compact "Packaged" unit makes your selling job easier because it is completely engineered . . . completely flexible. The Chrysler Airtemp name means *greater profit* for *you!*

Comfort Zone



"Packaged" Air Conditioners
Six models from 2 to 15 H. P. capacity. Meets every cooling need.

Chrysler Airtemp

HEATING • AIR CONDITIONING
***for* HOMES, BUSINESS, INDUSTRY**
Airtemp Division, Chrysler Corporation, Dayton 1, Ohio

Get all the facts . . . mail the coupon today

Airtemp Division, Chrysler Corporation
P.O. Box 1037, Dayton 1, Ohio

H&V-2-53

Please send full details on the Chrysler Airtemp Comfort Zone "Packaged" Air Conditioning proposition.

Name _____

Address _____ Phone _____

City _____ Zone _____ State _____

Let's not overlook

Quality is a relative term — it can be poor, medium, high or the best. We think you should evaluate fans and air cleaning and conditioning equipment according to the "Q" Factor.*

Engineers are not easily misled when they turn an engineering eye on mechanical things. They know that efficiency is important, and that rugged construction, ease of assembly and repair are also desirable. They value simplicity if it's not for economy of manufacture. Above all, we believe, they admire reliable, long life performance.

Because in seventy-five years of manufacturing fans, air cleaning and conditioning equipment, we have stuck to an original idea — "build it the best we know how", we welcome your critical inspection of "Buffalo" products. You'll find that both design and construction contribute to their record for long life on the job.

Engineering sales representatives in principal cities are anxious to work with you.

**The "Q" Factor — The built-in Quality which provides trouble-free satisfaction and long life.*

BUFFALO FORGE COMPANY

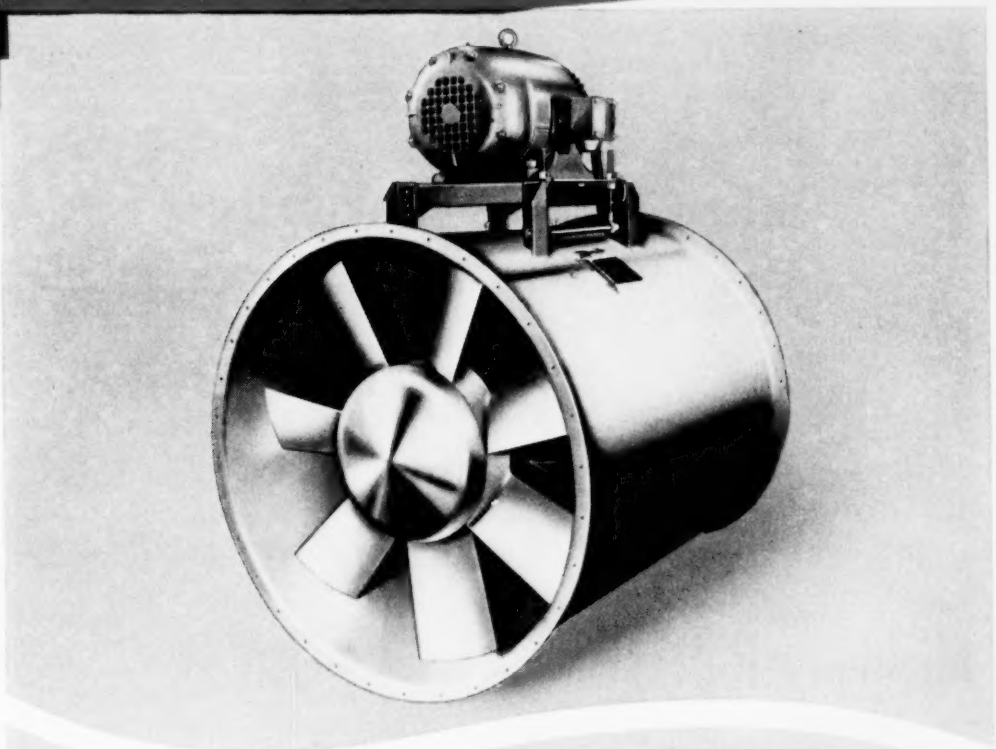
480 BROADWAY — BUFFALO, NEW YORK

PUBLISHERS OF "FAN ENGINEERING" HANDBOOK

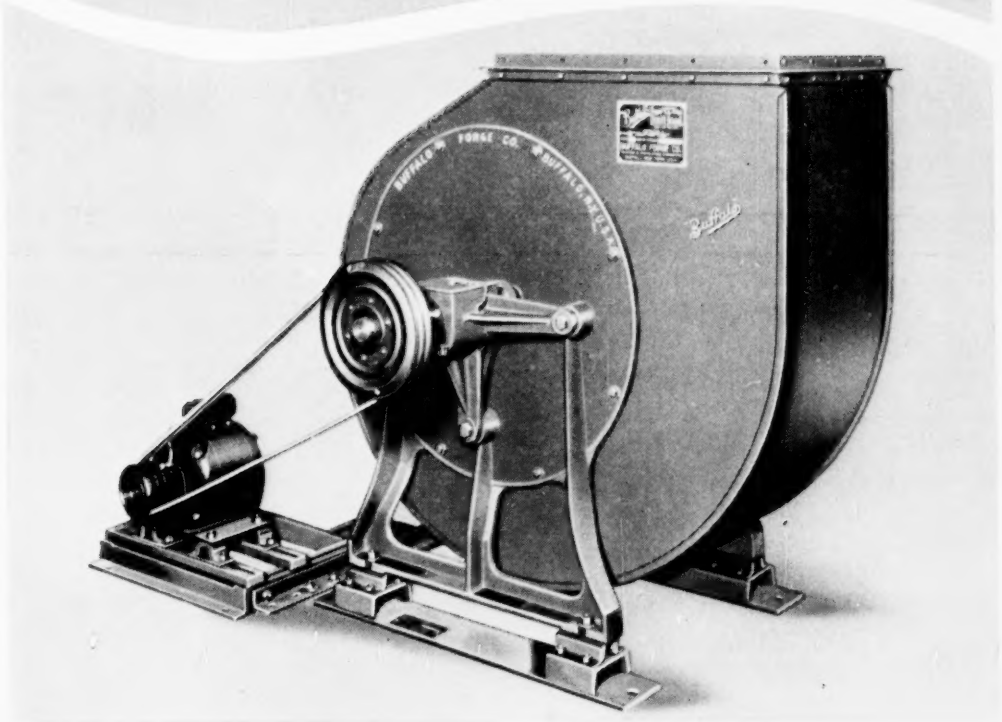
Canadian Blower & Forge Co., Ltd., Kitchener, Ont. Sales Representatives in all Principal Cities

DIAMOND JUBILEE 75TH ANNIVERSARY

QUALITY



The quiet, efficient Type "B" Vaneaxial Fan is one reason why "Buffalo" has earned—and kept—the reputation "First for Fans."



"Buffalo" Limit-Load, the fan that supplies the air for many of the world's finest ventilating and air conditioning systems.

Architects and Engineers:
Smith-Hinchman & Grylls, Inc.
General Contractor: Bryant & Detwiler Co.
Mechanical Contractor: Harrigan & Reid Co.

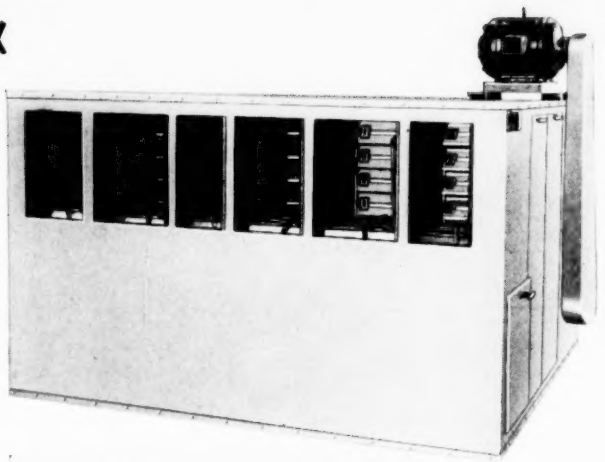
18 Marlo MULTI-ZONE AIR CONDITIONING UNITS WILL PROTECT DELICATE EQUIPMENT ...KEEP WORKERS COMFORTABLE

in Michigan Bell's New Annex

Delicate telephonic equipment needs special protection. Correct temperature and humidity conditions must be carefully maintained at all times... to prevent breakdowns... to provide steady, uninterrupted service for subscribers. And telephone company employees, of course, must have comfortable surroundings in which to work.

The complex and exacting air conditioning requirements in the new Michigan Bell Telephone Company annex in Detroit will be met by 18 dependable MARLO Multi-Zone Units—each capable of performing six different air conditioning functions *at the same time.*

MARLO equipment can solve *your* air conditioning problems, too. Ask your architect or engineer, or write Marlo for complete information.



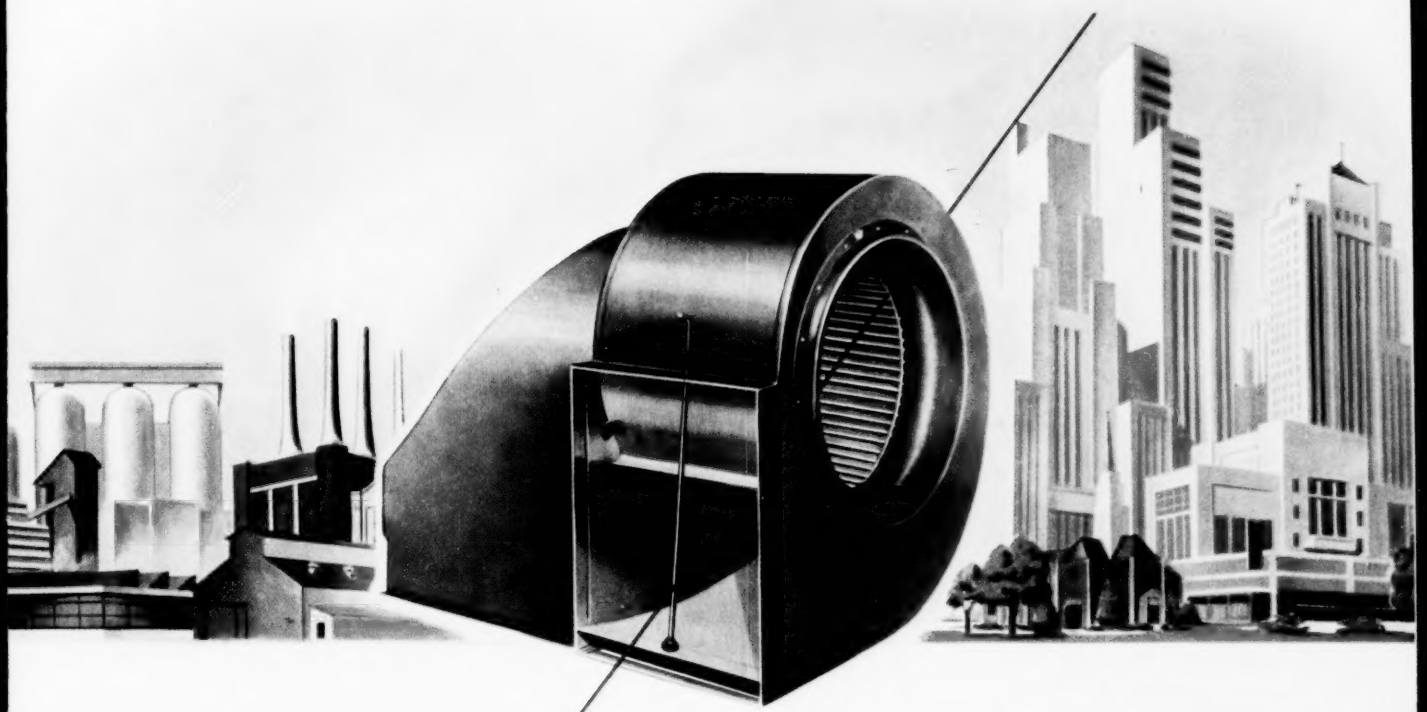
MARLO MULTI-ZONE UNITS
meet exacting air conditioning needs.

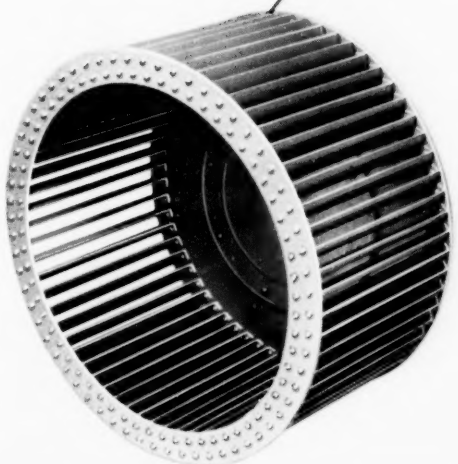
Marlo COIL COMPANY

Manufacturers of COOLING TOWERS • EVAPORATIVE CONDENSERS • INDUSTRIAL COOLERS • AIR CONDITIONING UNITS • MULTI-ZONE UNITS • BLAST HEATING & COOLING COILS

Saint Louis 10, Missouri

American Blower – a time-honored name in air handling





The heart of an American Blower Utility Set is this dynamically balanced Sirocco wheel which provides large volumetric capacities at low peripheral speeds.

Need air in your business?

Want a "work horse" that has proved to be a good investment in hundreds of industries?

Then, put these time-proved, quality-built American Blower Utility Sets to work. They are unsurpassed for general ventilation where duct systems are required.

There's an American Blower product for every air handling need — for process work, for pressure duties, for ventilating, heating, cooling, air conditioning.

Just call one of our branch offices for data.

AMERICAN BLOWER CORPORATION, DETROIT 32, MICHIGAN
CANADIAN SIROCCO COMPANY, LTD., WINDSOR, ONTARIO

Division of American Radiator & Standard Sanitary Corporation

AMERICAN BLOWER

YOUR BEST BUY IN AIR HANDLING EQUIPMENT

Serving home and industry

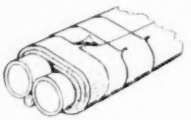
AMERICAN-STANDARD • AMERICAN BLOWER • CHURCH SEATS & WALL TILE • DETROIT CONTROLS • KEWANEE BOILERS • ROSS HEATER

How to wrap up a tough insulating job... in a hurry!

MICROLITE *Glass Fiber Insulating Wool* goes around this air conditioning duct with the greatest of ease. The men simply snip off a section of the feather-light blanket, pull it snugly around the duct, and secure it with glass tying cord. A single, simple wrap-around operation—and the duct is well insulated against heat loss or gain. Microlite comes to you in resilient blankets up to 72 inches wide, 200 feet long, 3 inches thick, compressed in easily-stored rolls.

You can't conscientiously proceed with any insulating job until you've investigated Microlite, a product of Glass Fibers' exclusive electronic-extrusion process. Write for the facts. Glass Fibers Inc., 1810 Madison Avenue, Toledo 2, Ohio.

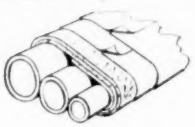
MICROLITE *insulates effectively against heat transfer.*
MICROLITE *is pleasant to handle, cuts with scissors.*



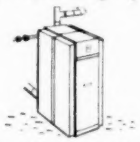
STEAM-TRACER LINES

VALVES AND FITTINGS

MICROLITE *weighs as little as* $\frac{1}{2}$*-pound per cubic foot.*
MICROLITE *compresses readily, springs back fully.*

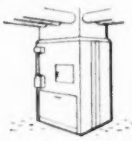


NESTED PIPES

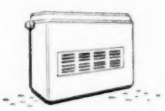


DOMESTIC BOILER

MICROLITE *is shipped in space-saving compressed rolls.*
MICROLITE *is an excellent absorber of unwanted noise.*



WARM AIR FURNACE



AIR CONDITIONER

MICROLITE *is inorganic, resists fire and moisture.*
MICROLITE *is tough, withstands rough handling.*

GLASS FIBERS INC.

Makers of glass fibers by the ELECTRONIC-EXTRUSION process . . . developed, patented and used exclusively by Glass Fibers Inc.

VITRON Yarns • Rovings • Micro-Fibers • Pipe Wraps • Industrial Mat • DURAMAT Vapor Barriers
VIBRAGLASS Machinery Mounting and Packaging Materials • COUSTIC-AIRE and THERMO-JET Aircraft Insulations

ADJUSTABLE PIPE HANGERS AND SUPPORTS

for every piping requirement

NO. 5 OF A SERIES SHOWING THE GRINNELL LINE

SOCKETS
COUPLINGS
TURNBUCKLE

Socket only for split ring fig. 110R 3/8 to 7/8 in. rod

Weldless eye nut fig. 290 3/8 to 1 1/2 in. rod

Forged steel clevis fig. 299 3/8 to 1 1/8 in. rod

Turnbuckle drop forged steel fig. 230 3/8 to 1 1/2 in. rod

Rod coupling fig. 136 3/8 to 7/8 in. rod

Adj. swivel coupling fig. 134 3/8 to 7/8 in. rod

Turnbuckle adjuster fig. 114

Rod coupling fig. 208 toggle bolt fig. 209 3/8 to 7/8 in. rod

U-HANGERS
EXTENSION
CEILING PLATE

Standard U bolt fig. 137

Adj. wrought U pipe hanger fig. 252 3/8 to 7/8 in. rod

Extension piece fig. 157 3/8 to 7/8 in. rod

Spring Ceiling plate fig.133 3/8 to 3/4 in. rod

ASSEMBLIES

Split ring with socket and coach screw

Split ring, socket and ceiling flange

Extension split ring hanger fig. 139

Adj. swivel ring with coach screw fig. 100

Adj. clip hanger fig. 106

Call your local Grinnell Distributor, or write for Hanger Catalog.

GRINNELL

AMERICA'S #1 SUPPLIER OF PIPE HANGERS AND SUPPORTS

Grinnell Company, Inc., Providence, Rhode Island • Coast-to-Coast Network of Branch Warehouses and Distributors

Manufacturer of: pipe fittings • welding fittings • forged steel flanges • steel nipples • engineered pipe hangers and supports
Thermolier unit heaters • Grinnell-Saunders diaphragm valves • prefabricated piping • Grinnell automatic fire protection systems

For LOW-COST DEPENDABLE steam,

UPJOHN burns COAL the modern way!

Upjohn's new pharmaceutical plant which includes units for production of penicillin and cortisone, as well as some 700 other pharmaceutical products, relies on coal for dependable steam!

The firing aisle of Upjohn's ultramodern steam plant. This plant supplies steam, cleanly and efficiently, at only 40¢ to 42¢ per 1,000 lbs. for the Portage Road Plant near Kalamazoo, Michigan. There are no dust or smoke nuisances, thanks to the dust-collecting and cinder re-injection system. Ash handling is fully automatic. These 3 boilers, plus a fourth recently installed (not illustrated), deliver up to 115,000 lbs. steam per hour at peak load.

Whether you're building a new plant or modernizing an older one, you can count on coal for dependability and low-cost operation.

Here's why: Up-to-date coal-burning equipment can give you 10% to 40% more steam per dollar. Automatic coal- and ash-handling systems can cut your labor cost to a minimum. Let a consulting engineer show you how a modern coal installation, tailored for your specific needs, can save you real money.

Here's something else, too—of all fuels, coal alone has virtually inexhaustible resources. This, plus the fact that America's highly mechanized coal industry is the most efficient in the world, assures you of a dependable supply of coal at relatively stable prices now and for years to come.

If you operate a steam plant, you can't afford to ignore these facts!

COAL in most places is today's lowest-cost fuel.

COAL resources in America are adequate for all needs—*for hundreds of years to come.*

COAL production in the U.S.A. is highly mechanized and by far the most efficient in the world.

COAL prices will therefore remain the most stable of all fuels.

COAL is the safest fuel to store and use.

COAL is the fuel that industry counts on more and more—for with modern combustion and handling equipment, the inherent advantages of well-prepared coal net even bigger savings.

BITUMINOUS COAL INSTITUTE

A Department of National Coal Association, Washington, D. C.

FOR HIGH EFFICIENCY FOR LOW COST

YOU CAN COUNT ON COAL!

DEPENDABILITY . . .
that builds reputation
Delco Motors

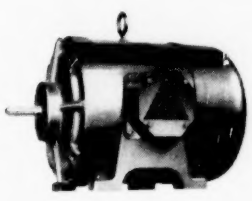
If your product needs a power source, look to Delco for the motor that will serve you best. Delco makes motors for most industrial applications . . . motors famous for dependability and long life under the toughest operating conditions.

So . . . check on Delco. You'll find a Delco motor that fits your needs. For complete details write to Delco Products, Dayton, Ohio, or to the nearest sales office listed below.

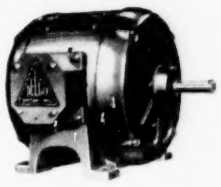
DELCO
DAYTON OHIO

DELCO PRODUCTS

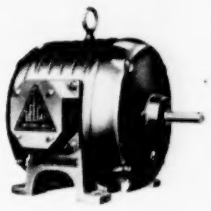
Division of General Motors Corporation
Dayton, Ohio



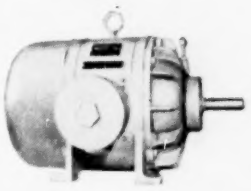
Totally Enclosed Fan-Cooled Motor



Open Ball-Bearing Motor



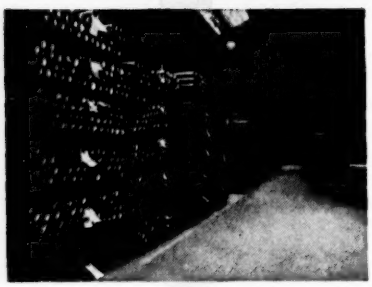
Totally Enclosed Motor



Explosion-Proof Motor

SALES OFFICES: Atlanta • Chicago • Cincinnati • Cleveland • Dallas • Detroit • Hartford • Philadelphia • St. Louis • San Francisco

HOW DO YOU CHOOSE BETTER BOILER TUBES?



All boiler tubes are made to the same specifications to do the same jobs, no matter what mill supplies them. In the warehouse, they all look pretty much the same. Surface comparison rarely shows the difference. That is because only *time* can truly test the worthiness of a tube in a boiler—time and the ravages of heat, corrosion and oxidation. Look for the answer down in the basements of apartment houses, or hospitals, or schools, or office buildings, or anywhere else you'd expect to find good boilers, made by fine craftsmen, performing efficient and faithful service over the years. Almost anywhere you look, you'll find the most reliable boilers are equipped with B&W boiler tubes.

Say B&W before you say WELDED BOILER TUBES—for Service-Proved Dependability. For three-quarters of a century, B&W has been directly concerned with developing and applying boiler tubes for pressure requirements. The application of this extensive knowledge and experience results naturally in the production of superior boiler tubes.

B&W dependability is proved by time and endorsed by hundreds of customers who keep coming back for more . . . B&W WELDED BOILER TUBES.

B&W SEAMLESS and WELDED TUBES

THE BABCOCK & WILCOX COMPANY
TUBULAR PRODUCTS DIVISION

General Offices & Plants
Beaver Falls, Pa.—Seamless Tubing; Welded Stainless Steel Tubing
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Sales Offices: Beaver Falls, Pa. • Boston 16, Mass. • Chicago 3, Ill. • Cleveland 14, Ohio • Denver 1, Colo. • Detroit 26, Mich. • Houston 19, Texas • Los Angeles 17, Cal. • New York 16, N. Y. • Philadelphia 2, Pa. • St. Louis 1, Mo. • San Francisco 3, Cal. • Syracuse 2, N. Y. • Toronto, Ontario • Tulsa 3, Okla.

TA-1694C

COPELAMETIC

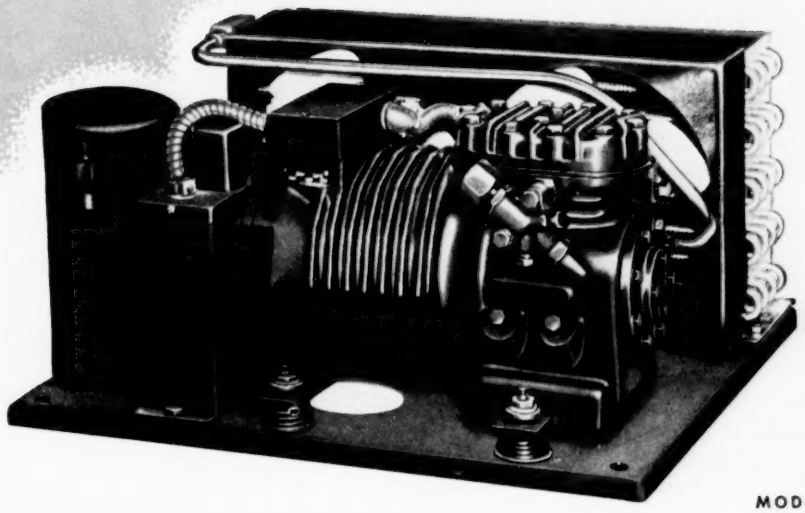
THE *Accessible* HERMETIC

compact . . .
dependable . . .
quiet . . .

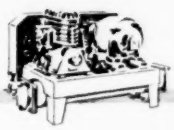
Compact . . . dependable . . . quiet. Those are the prime requirements for the refrigeration unit in any air conditioning system. Add to them ruggedness, accessibility and long life and you have the COPELAMETIC.

For the unit that has everything, look to Copeland the pioneer. Practical-minded engineers designed this modern unit without belts, seals or manual oiling, and to top that they made it accessible for servicing on the spot. Specify COPELAMETIC and be sure of a satisfied client for years to come.

There's a Copeland unit for every type air conditioning installation from smallest to largest. Air-cooled, remote COPELAMETICS are made from 1/4 thru 3 HP. There are water-cooled, remote units from 1/3 thru 7-1/2 HP. Self-contained COPELAMETICS are available for all applications. For complete details, write us or call your refrigeration dealer.



MODEL DE-100 ILLUSTRATED



REFRIGERATION UNITS (OPEN TYPE AND COPELAMETIC) WATER COOLERS

Copeland
DEPENDABLE *Electric* REFRIGERATION

COPELAND REFRIGERATION CORPORATION • SIDNEY, OHIO

PUTTING *Air* TO WORK FOR WESTERN ELECTRIC

She's adjusting a telephone dial mechanism, surrounded by an invisible dirt barrier of controlled air.

AIR CONTROL

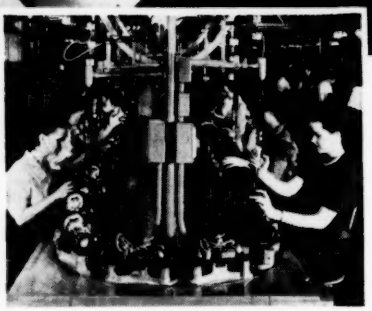
PUTS PRECISION IN YOUR TELEPHONE

If you make a precision product, and mass-produce it, you can't tolerate airborne dirt. That's why Western Electric takes special pains to banish dirt and grit when they make your telephone sets. And they do it in a very simple way. They use *air*.

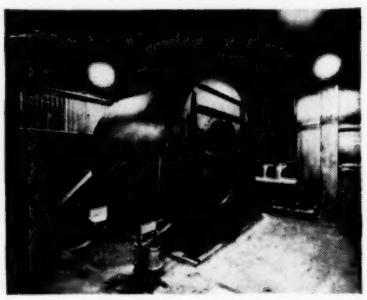
Throughout their huge Indianapolis plant a positive air pressure is maintained—just slightly higher than normal outside atmosphere. This sets up an outward air movement which specks of dirt just can't buck. Result: air keeps dirt out, instead of carrying it in!

32 big Westinghouse fans furnish a constant supply of filtered air 24 hours a day, every day. Because of their high efficiency, they operate at a low power cost. That's important, for at peak capacity these fans move 2,300,000 cubic feet of air per minute.

You can *put air to work* in many ways to improve your own operations. Our trained engineers are ready to help you. And Westinghouse makes the most complete line of air handling, air conditioning and air cleaning equipment. Ask for General Catalog 600 which describes these products and their many uses. Contact your local Westinghouse-Sturtevant office, or write Westinghouse Electric Corp., Sturtevant Division, Hyde Park, Boston 36, Mass.



No dirt means greater precision, fewer rejects, healthier conditions, when controlled air teams up with mass production.

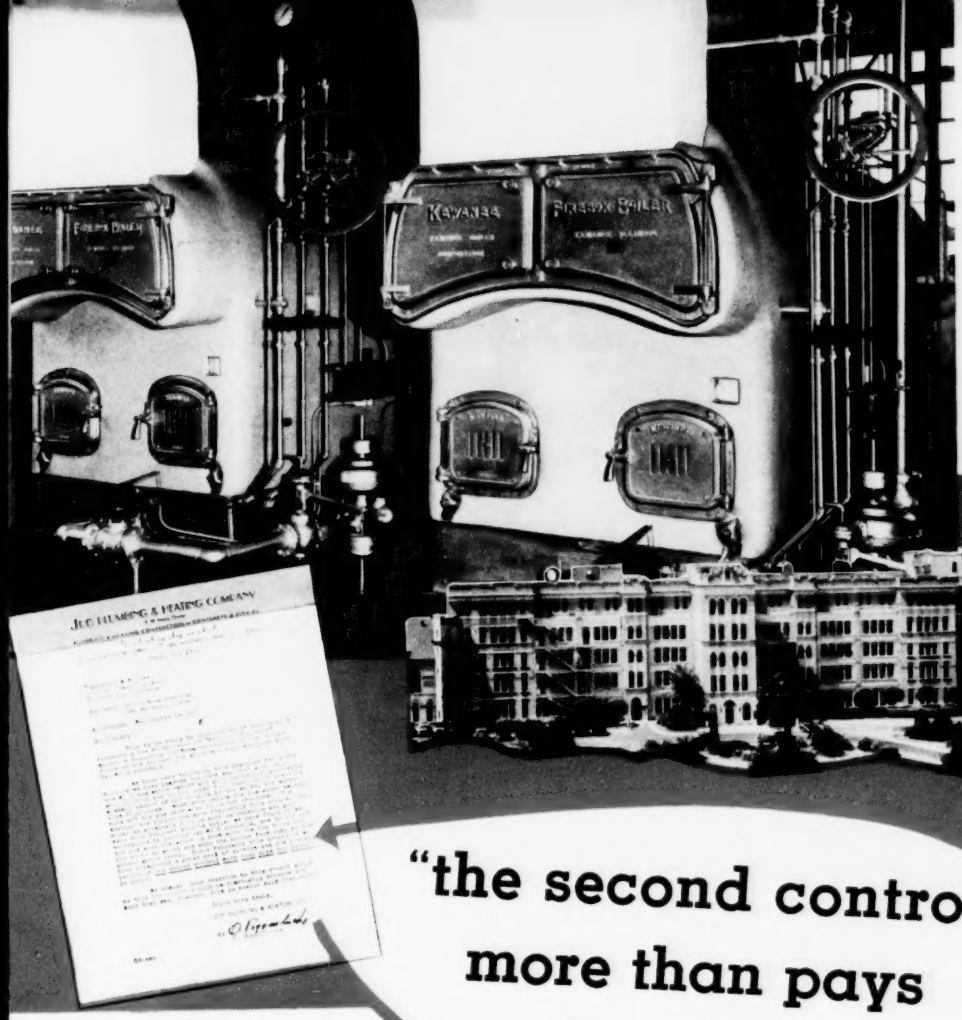


32 efficient Westinghouse fans provide ventilation and keep dirt out. Because of their non-overloading blade design, motor burnouts are not a problem.

YOU CAN BE SURE... IF IT'S Westinghouse

J-80272

AIR HANDLING



SANTA ROSA HOSPITAL
San Antonio, Texas

Architect:
Phelps, Dewees & Simmons

Engineer:
Gerard M. Baker

Heating Contractor:
Jud Plumbing & Heating Co.

"the second control more than pays for itself"

HERE you see the utmost in boiler water level control keeping excellent company. Those No. 150 Pump Controllers and Low Water Cut-offs are installed on two large modern Kewanee firebox boilers in the boiler room of a big new addition to San Antonio's already large and famous Santa Rosa Hospital.

The men and firms who turned out this commendable job are listed above. An interesting aspect of the engineering is the use of two McDonnell No. 150 Controls on each boiler; one positioned higher than the other; the upper control used solely to control the feed pump; the lower, solely as a low water cut-off to stop the gas burner.

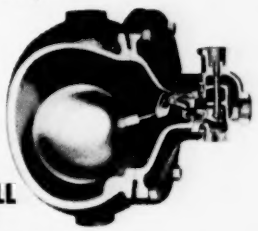
In a letter from the heating contractor, the reason for this arrangement was given: When the controls were installed, it was decided that local conditions would produce considerable fluctuations in the boiler water level which would often cause the low water cut-off switch to stop the burner when there was no actual condition to warrant cutting off. By setting the low water cut-off so that it will stop the burner only when there is a serious low water condition, unnecessary service calls are avoided. As a result, says the letter, "the second control more than pays for itself."

The resourcefulness to meet special conditions in a practical way is characteristic of men who know their heating and equipment. So it is not surprising to find McDonnell equipment in so many of these well engineered, capably-executed installations.

McDONNELL
No. 150 Control

Maximum Steam Pressure, 150 lbs.
Underwriters' Approved

Holds boiler water level within the close limits that assure maximum steaming efficiency and fuel economy. Ask for complete set of installation and wiring diagrams covering both single and battery boiler jobs.



McDONNELL
No. 27

Make-up Water Feeder

An excellent team-mate for the No. 150, this McDonnell make-up water feeder is mounted on the receiving tank to maintain a minimum water level at all times.

McDONNELL & MILLER, *Inc.*, 3500 N. Spaulding Ave., Chicago 18, Ill.

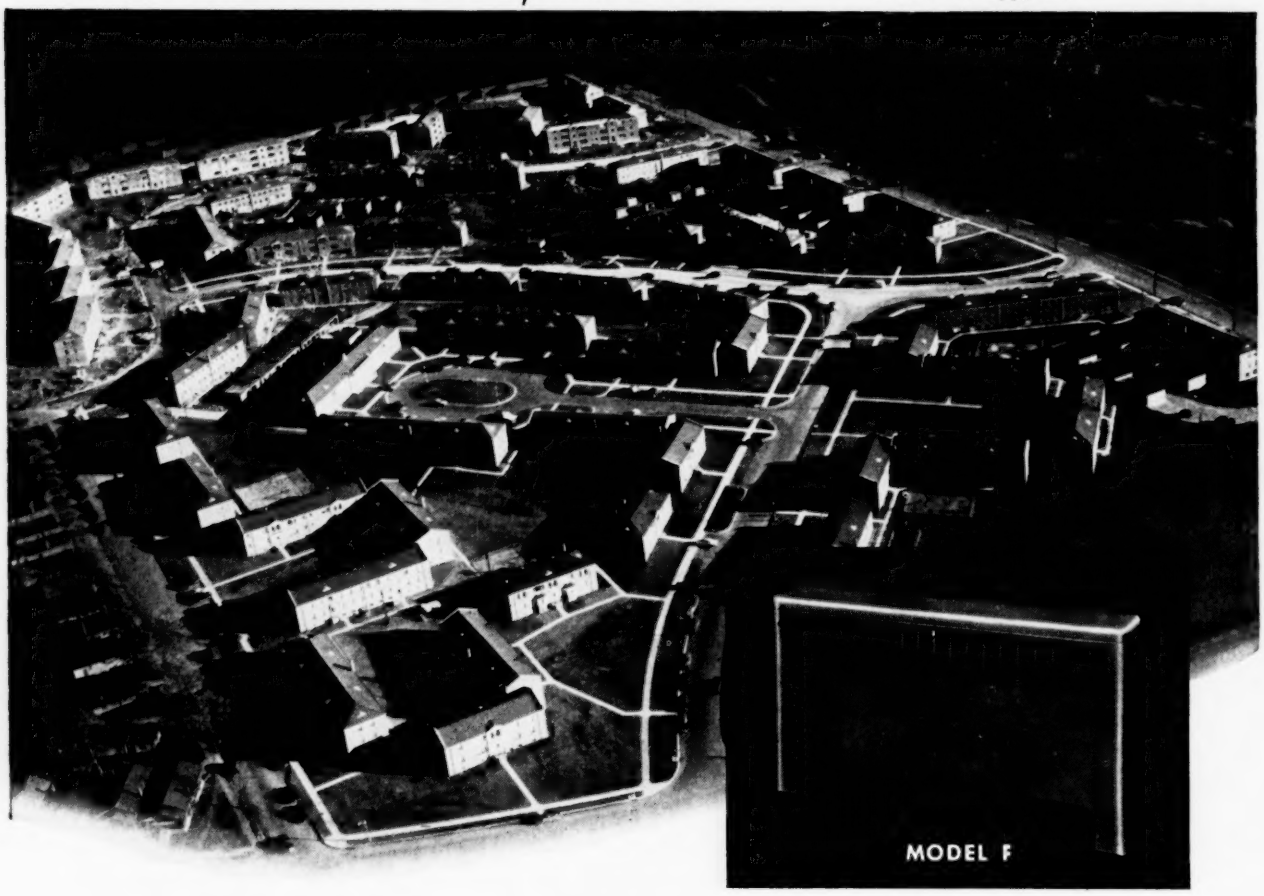
Doing One Thing Well

Your Jobber Stocks Them

McDONNELL *Boiler Water Level Controls*

HAMPTON GARDENS, *St. Louis*

Leo F. Abrams, architect
Natkin & Co., heating contractors
Webb & Knapp, Inc.



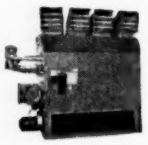
3,200 AIRTHERM CONVECTORS

selected to comfortably heat the 500 dwelling units of this new, self-contained residential community for Mid-America

Here Airtherm Convectors fit functionally into the handsome Colonial design, demonstrating their wide adaptability to all types of decor, from traditional to modern. Savings in labor and installation costs were made possible by Airtherm's simplicity and ease in handling and connecting.

Airtherm Convectors are available for wall, recessed, or free-standing installation.

For Heating Satisfaction... Think First of *Airtherm*


Oil or Gas Direct Fired Heaters

Horizontal Type Unit Heaters

Vertical Type Unit Heaters

Centrifugal Fan Type Unit Heaters

AIRTHERM MANUFACTURING COMPANY
722 South Spring Avenue • St. Louis 10, Missouri

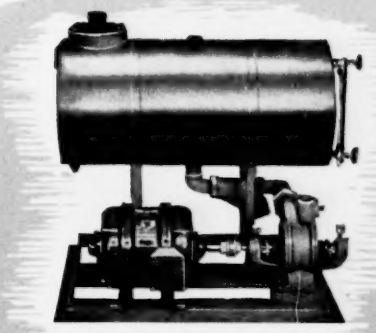
133

Which type of heating pump do you require?

The Skidmore Type HS Pump is very popular where maximum efficiency is required with small investment. Pump is of close grain, vertical-split cast iron construction with bronze fittings throughout.

TYPE HS Pump will operate at a wide range of pressures encountered in condensation pumps. Capacities—range from 1,000 to 65,000 sq. ft. E.D.R., and discharge pressures from 10 to 75 pounds. Single or duplex units.

Send for Bulletin No. 14-A

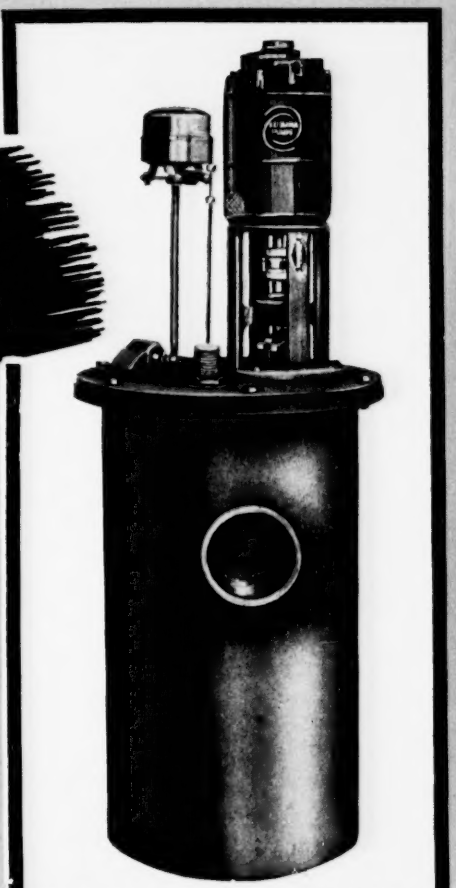


TYPE TM Turbine Pump is completely assembled and mounted on either steel or cast iron base.
CAPACITIES—Built for boilers up to 250 H.P. and discharge pressures up to 150 pounds.

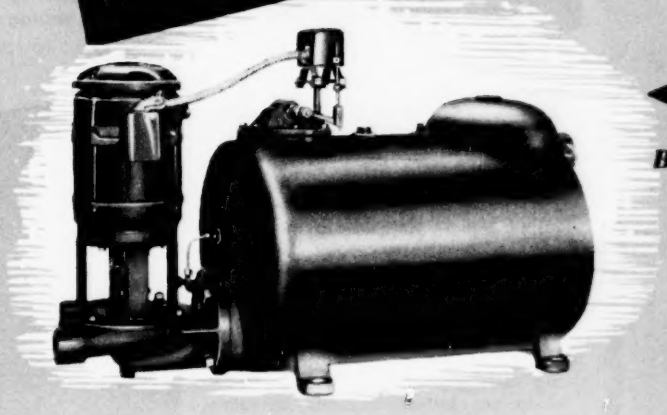
Send for Bulletin No. 17

SKIDMORE PUMPS

Choose with Confidence



TYPE UV Pump is recommended for below floor level returns. Unit is bolted to sump type receiver.
CAPACITIES — ranging from 2,000 to 40,000 sq. ft. E.D.R., and discharge presssures from 10 to 75 pounds. Single or duplex units.



Send for Bulletin No. 10-B

TYPE VC Skidmore Condensate Pump is built for rugged and dependable service. Pump has low inlet connection, perfect balance and absence of vibration.
CAPACITIES—range from 1,000 to 65,000 sq. ft. E.D.R., and discharge pressures from 10 to 75 pounds.

Send for Bulletin No. 19-A

SKIDMORE CORPORATION, ST. JOSEPH, MICHIGAN

1853

"This sectional boiler principle means the birth of central heating!"

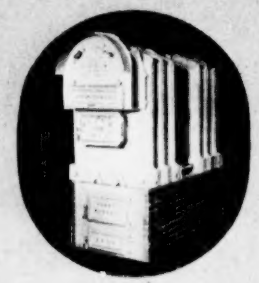
Boats still lay in the old canal basin at Westfield, but the canal warehouse had become a foundry in 1853. It was then that Henry B. Smith, a successful merchant, editor and printer, and his brother, Edwin, a banker, acquired the property and established H. B. Smith & Company. By 1859 the Company had built a reputation for fine cored castings.

At this time John R. Reed, 27, began a long and successful career with the Company.

The parlor stove was replacing the fireplace, but the Smith brothers and Reed foresaw the day when steam, generated in a central boiler, could be piped to radiators in all rooms. They were ready in 1859 when Samuel Gold, inventor of a cast iron sectional boiler, negotiated with the Company for its manufacture. Purchasing Gold's patents, the Company became the first to manufacture and market cast iron sectional boilers. Fostered by engineering ingenuity and manufacturing skill, the Gold patent boiler has been developed into the world's broadest line of cast iron boilers for heating.

BIRTH OF AN INDUSTRY . . . AND AN ERA

Far ahead of its time was the original Gold Patent Boiler, pioneer of wet heating . . . first commercially practical cast iron sectional boiler.



Easiest to Install!

Because H. B. Smith cast iron boilers are assembled from precision-machined sections and parts, they are easily erected at the installation with a minimum of labor. Can be erected on location at any stage in building.

Easiest to Convert!

H. B. Smith boilers are easiest to convert to different fuels, should the one in use become in critical supply. All operate with great efficiency with solid fuel, oil or gas. In low-cost natural gas areas, H. B. Smith boiler conversions are bringing clean, trouble-free, inexpensive heat to hundreds of users.

Easiest to Expand!

When increasing the capacity of an H. B. Smith boiler to meet additional heating requirements, or when replacing it, it is not necessary to tear out a wall, part of a foundation, or both. In Header-type Series 24 – 34 – 44 and 42 and 60 Boilers, a damaged section can be cut out of the line without delay or extensive repairs.

1953 World's Broadest Line

Series 100 and 2000 Smith-Mills Boiler-Burner Units for Homes and Smaller Commercial Installations.

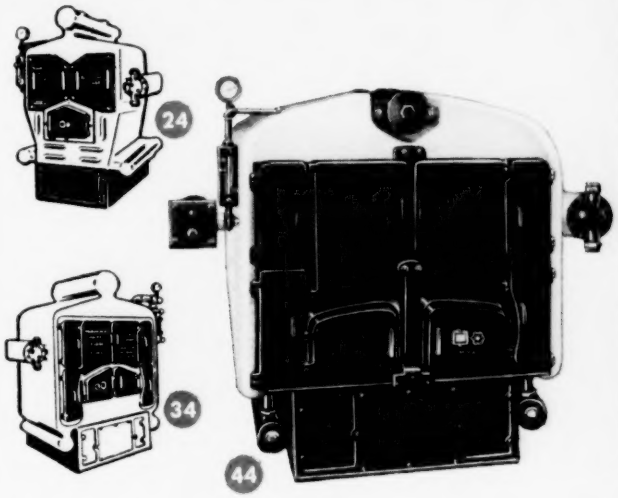
Compact, easy to install! Designed to give fast heat and plenty of hot water for the average home. Furnished with built-in tank type or "tankless" water heater; available with flush jacket as shown, or with jacket expanded to conceal the oil burner.

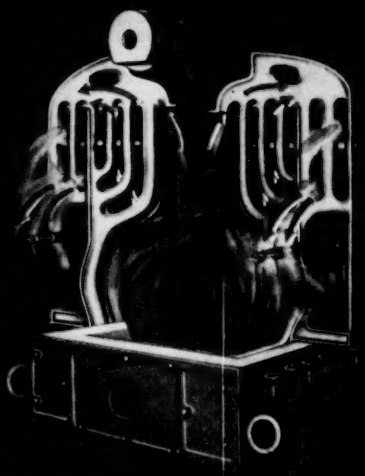
Series 15, 20, 25 Smith-Mills Boilers for Homes and Smaller Commercial Installations.

Here's a complete series of modern push nipple boilers available in models for oil, gas, coal stoker or hand firing, with provision for built-in domestic water heaters and controls. Capacities of 200 sq. ft. to 2275 sq. ft. steam radiation.

Line includes the RELIANCE Boilers, Series 20 EG and 25 EG, embodying combustion chamber at rear for oil-burner installation, and complete fire box with grates for coal and wood firing in case of power shut-off.

A CENTURY IN '53 -- OUR YEAR OF GREATEST PROGRESS





Series 24, 34, 44 Mills Boilers for Schools, Apartments, Public Buildings

Capacities of 900 sq. ft. to 13,380 sq. ft. steam radiation. Independent header-type construction; there are tens of thousands of famous Mills boilers in schools, hospitals, apartment houses, stores and other commercial and public buildings. Models for hand and all types of automatic firing.

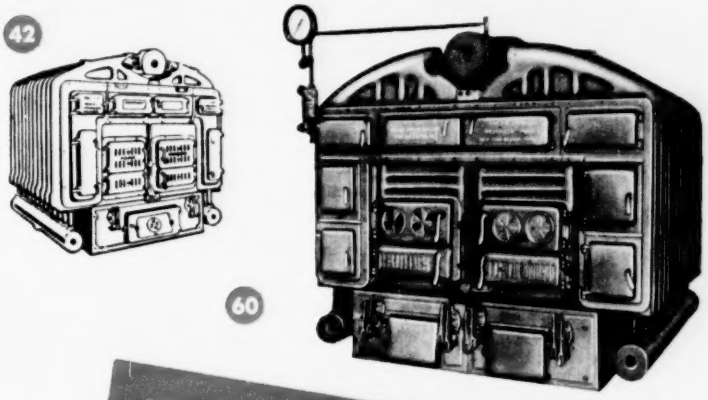
MORE HEATING SURFACE LONGER FLUE TRAVEL

Notice how the hot flue gases really get around the vertical cast iron water tubes: to top of boiler, across to each side, then to front through upper side flue channels, then down and back through the lower channels to the smoke outlet. Tall chimneys or induced draft systems are not necessary — distinct advantages in modern one-story buildings.

# of Cast Iron Boilers for Heating and Domestic Hot Water

Series 42 and 60 Smith Boilers for Large Installations

May be used singly, or in batteries for heating loads up to and over 100,000 sq. ft. steam radiation. Many of these large units installed in industrial plants furnish steam for process requirements as well as for heating and domestic hot water. Have header-type construction permitting the cutting off of one or more sections in emergency without serious shut-down.



Hy-Tests for Domestic Hot Water

Series 17, 24, 34 and 44, oil or hand-fired hot water supply units are most often used in connection with the larger types of heating installations, such as apartment houses, factories, public buildings, etc. They are all readily convertible from one fuel to another and work equally well with oil, coal or gas.

The 24, 34 and 44 Hy-Test boilers are all "Mills type" units with the famous Mills vertical water tubes and header type construction.

Coming!....a new GAS-FIRED BOILER

designed from the ground UP by H. B. Smith. It incorporates all of the best engineering in gas-fired boiler design and construction.

H. B. Smith CAST IRON BOILERS

THE H. B. SMITH CO., INC., WESTFIELD, MASS., ESTABLISHED 1853

VERSATILE *Acme*
EVAPORATIVE CONDENSERS
fit wide range of applications

The First Church of Christ Scientist in Birmingham, Alabama.

Two recent installations of Acme Evaporative Condensers show the wide range of applications for which they are ideally suited. The ability to conserve water makes the operation very economical, while the functional design assures complete hot weather comfort.

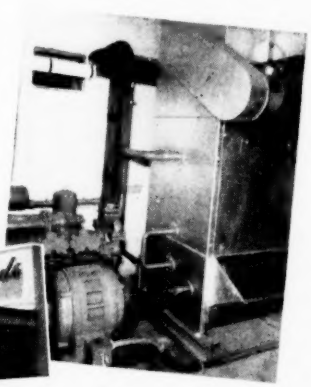
One installation was made in the First Church of Christ Scientist in Birmingham, Alabama, by the Hardy Corporation. The main auditorium seated 650 persons and a Sunday School room accommodated 148 more. Despite the variable load and Birmingham's hot climate the FP-60 Acme Evaporative Condenser has been highly efficient and completely satisfactory.

A completely different installation was made by the Krauss Heating and Ventilating Company, at the Gulf Winds Restaurant in St. Petersburg, Florida. An FP-30 evaporative condenser serving as an important component of the air conditioning system, was installed.

The air conditioning added much to the comfort of the patrons of this beautiful restaurant. Despite the unusual hardness of the water, the equipment is satisfactory in every respect, saving over 95% of the water used.

FP-60 Evaporative Condenser installation at the First Church of Christ Scientist.

Write for more complete details on the advantages of Acme Evaporative Condensers



FP-30 Evaporative Condenser installed at the Gulf Winds Restaurant.

The Gulf Winds, popular St. Petersburg, Florida restaurant.

ACME INDUSTRIES, INC. JACKSON, MICHIGAN, U. S. A.

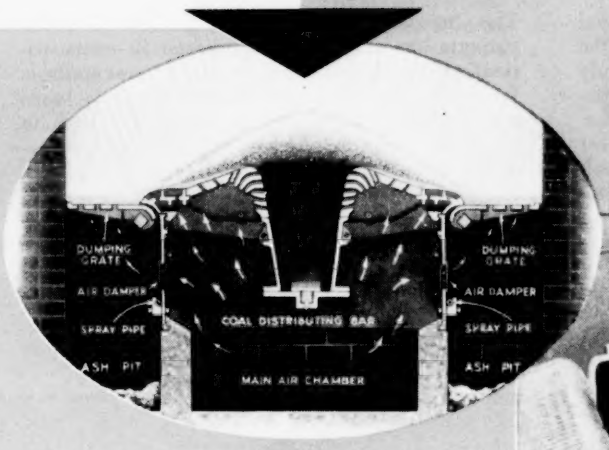
Air Conditioning and Refrigeration Division

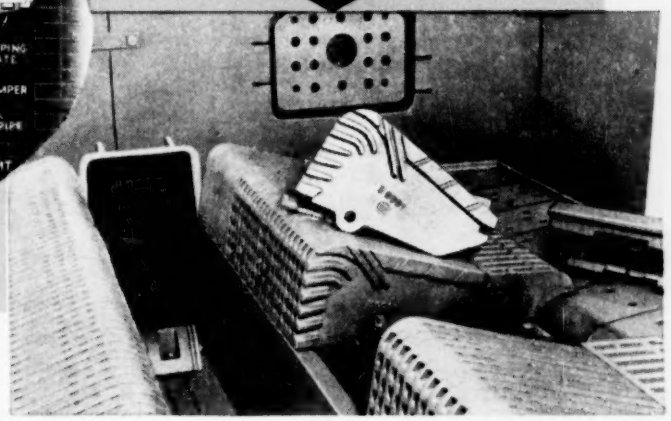
CONTINUOUSLY SERVING THE AIR CONDITIONING AND REFRIGERATION INDUSTRIES SINCE 1919

IT'S NEW

HI-TUYERE

AN IMPROVEMENT FOR DETROIT LO STOKERS (OLD OR NEW)





MORE AIR — Supplies more air toward the center of the retort, greatly increasing the coal burning capacity.

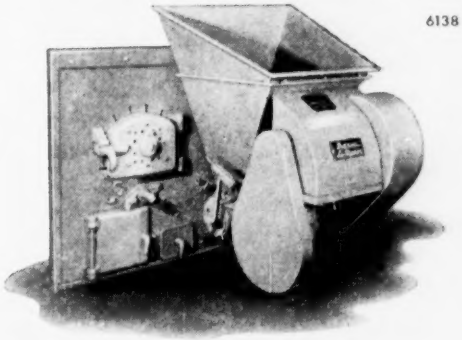
REDUCED COKING TENDENCY — This results in more uniform porosity of the fuel bed.

INCREASED EFFICIENCY — Provides better air penetration of the fuel.

LONGER LIFE — Increased cooling area due to greater depth of tuyere.

Hi-Tuyere is available in complete sets for your present stoker and is standard design for all new LoStokers.

6138



Detroit LoStokers now have Detroit Adjustable Feed Coal Feed Controls by which coal and air may be automatically varied to suit the load.

DETROIT STOKER COMPANY

GENERAL MOTORS BUILDING, DETROIT 2, MICHIGAN

Works at Monroe, Michigan • District Offices in Principal Cities

New Texas Hospital Demonstrates Flexibility of Honeywell Customized Temperature Control

System will meet wide range of temperature control needs

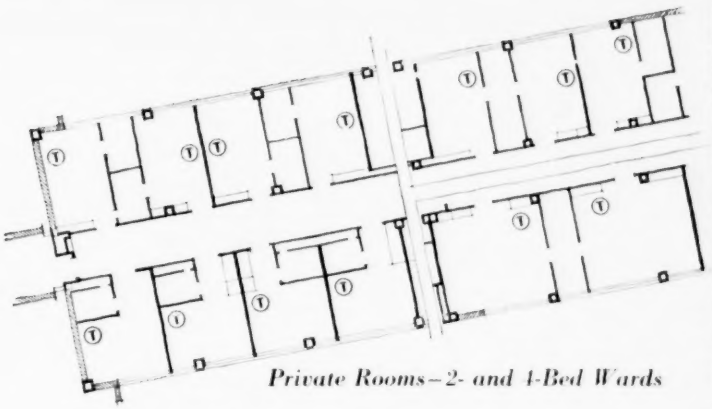
The University of Texas M. D. Anderson hospital for cancer research, now under construction in the Texas medical center at Houston, will be a truly outstanding addition to the country's medical facilities when it's completed sometime next year.

Carefully planned in every detail, this "cancer station" will contain such features as the first cobalt "bomb" in the United States for radiation treatment, color television for remote observation of operations and a betatron laboratory.

Another feature of this new building is that both heating and cooling will be controlled by Honeywell Customized Temperature Control.

The installation includes *comfort* control for patients—an individual thermostat in every patient's room. It includes operating room controls for both temperature and humidity. It includes a new electronic temperature control system to maintain photographic bath water within the exacting temperature range of plus or minus one-tenth of one degree Fahrenheit. And it includes electronic fume hood controls to remove dangerous fumes from radio isotope laboratories.

In the Anderson hospital, Honeywell Customized Temperature Control will indeed meet a wide range of temperature needs.



Private Rooms—2- and 4-Bed Wards

Notice on the floor plan that with Honeywell Customized Temperature Control each patient-room has its own individual thermostat. This means that *each* patient can be kept genuinely *comfortable* no matter what the weather outside. And it makes it possible for doctors to "prescribe" the exact temperature each patient needs to get well fast.

Plans for the Anderson hospital were developed by the following firms: MacKie & Kamrath, AIA, Architects, Houston; Schmidt, Garden & Erikson, Consulting Architects, Chicago; Lockwood & Andrews, Mechanical and Site Engineers, Houston; Walter P. Moore, Structural Engineer, Houston; Farnsworth & Chambers Co., General Contractors, Houston; Archer Plumbing Co., Mechanical Contractors, Houston.

For Comfortable, Even Temperature in New or Existing Buildings— of Any Size, Specify Honeywell Customized Temperature Control

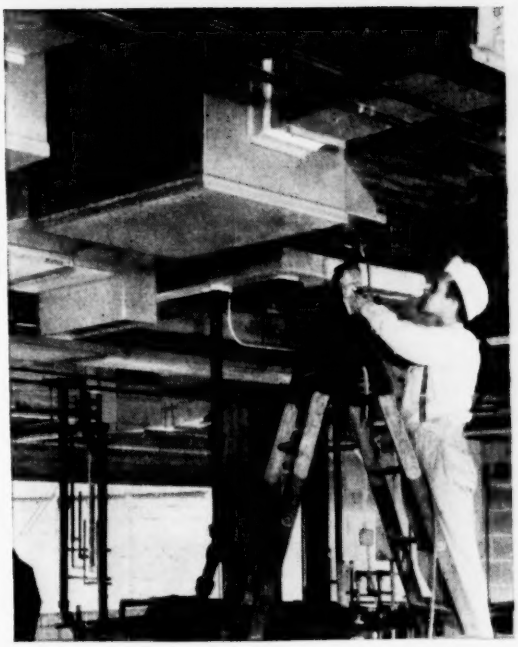
Whether it's a hospital, apartment, office, store, factory, school, garage — or any size building — new or existing, Honeywell Customized Temperature Control can help meet your clients' heating, ventilating and air conditioning problems.

Once equipped with Honeywell Customized Temperature Control, they'll have an ideal indoor "climate" — and save fuel besides.

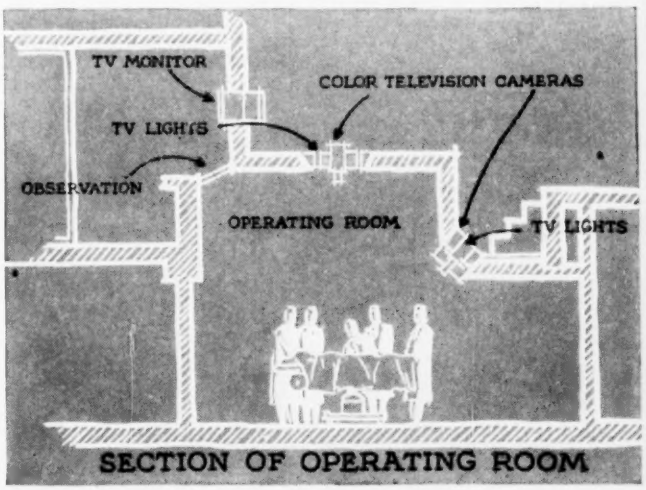
For full facts, call your local Honeywell office. There are 104 across the nation. Or mail the coupon today.

W. M. Andrews of Lockwood & Andrews, Consulting Engineers, says:

"It's an extremely flexible method of control. And that means Honeywell Customized Temperature Control can be used to meet nearly any temperature problem — in any type of building."



Honeywell Customized Temperature Control will control these air conditioning units suspended above doorways. Heating of rooms will also be thermostatically controlled. When installed *at time of construction*, system duct work can easily be concealed, can be put in at lowest cost.



Color television, as shown on the operating room cross section above, will permit over 300 students to watch surgery. Extra heat from television lights will be compensated for by sensitive Honeywell thermostats. Operating rooms will also be equipped with humidity controllers, an important feature in the Honeywell Customized Temperature Control installation.

MINNEAPOLIS **Honeywell**

First in Controls

MINNEAPOLIS-HONEYWELL REGULATOR CO.
Dept. HV-2-202, Minneapolis 8, Minnesota

Gentlemen:
I'm interested in learning more about Honeywell Customized Temperature Control.

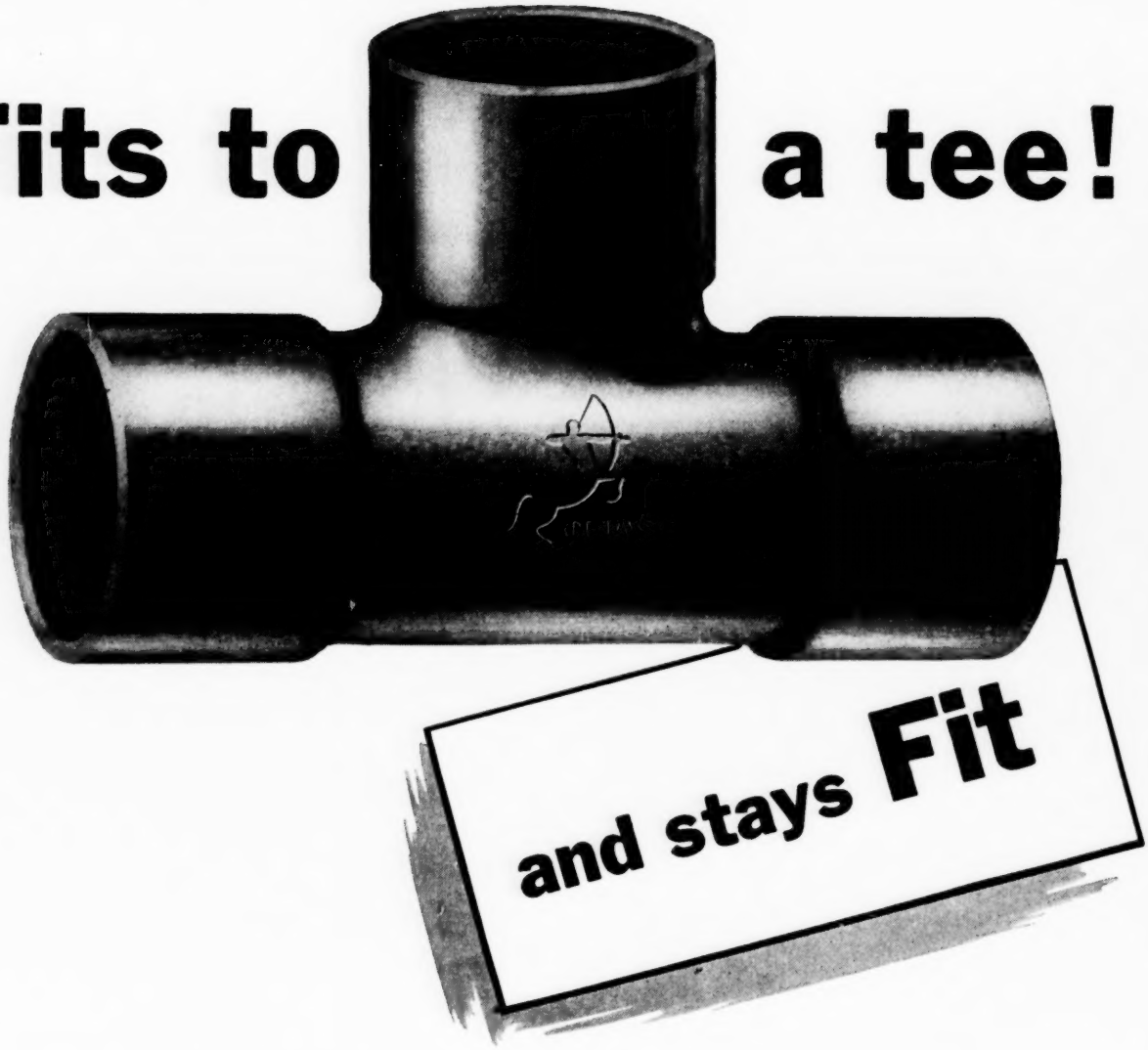
Name _____

Firm Name _____

Address _____

City _____ *Zone* _____ *State* _____

Fits to a tee!



even under 5,000 pounds per square inch pressure

It takes only minutes to make a Chase solder-joint that will stand up for years. In actual tests on assemblies of one-half inch Chase Copper Tube and Chase Solder-Joint Fittings, they have withstood over 3,400 pounds pull and 5,000 pounds per square inch water pressure.

Chase Flared Connections, too, are easy to make, tough to pull apart. Of course, all Chase fittings are corrosion-resistant, won't clog with rust. So for anything from drainage lines to radiant panel heating, be sure you specify Chase Copper Tube and Fittings. They assure better flow, longer life.

Write today for Free Chase Catalog on Solder-Joint and Flared Copper Tube Fittings.

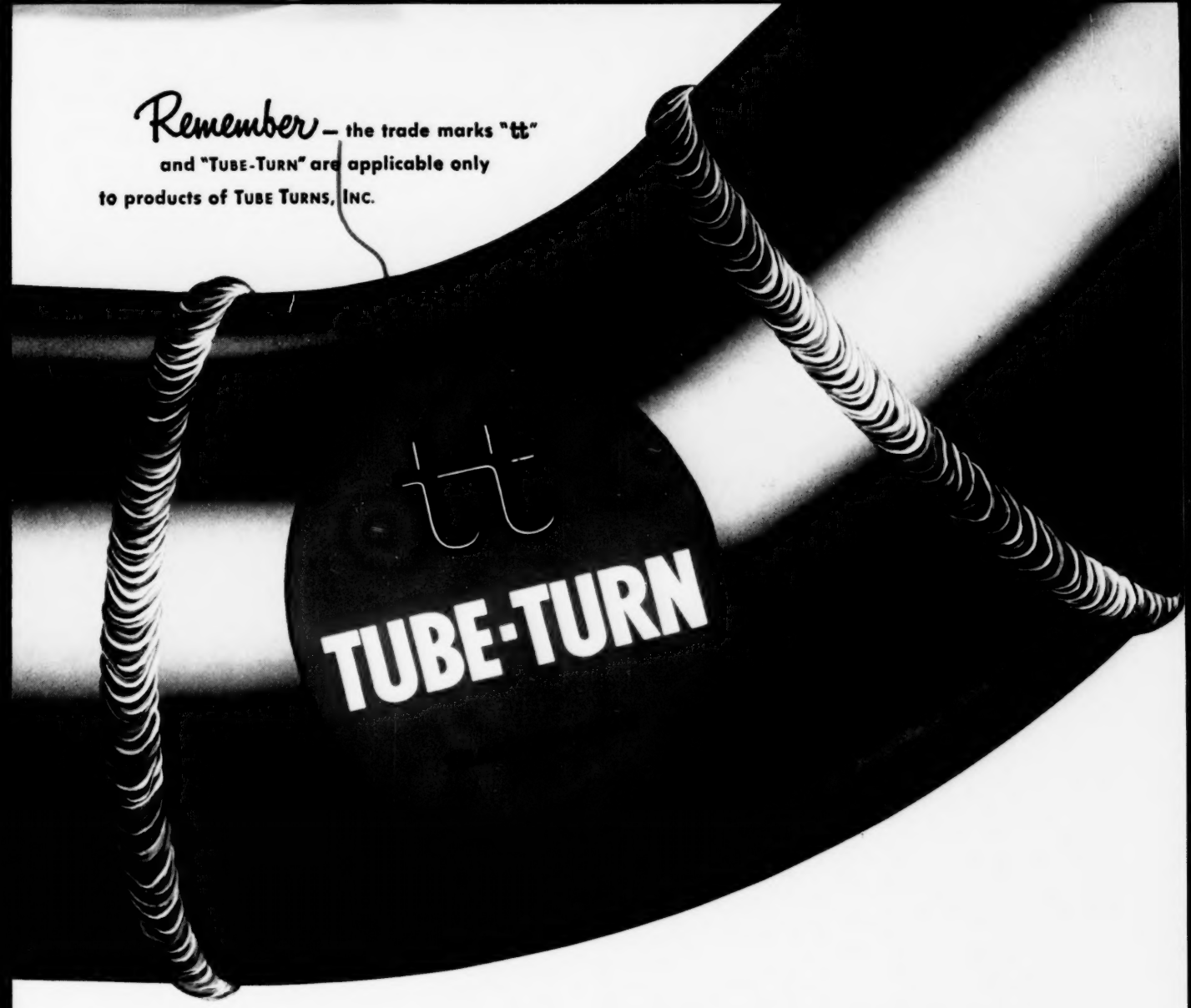
Chase BRASS & COPPER

WATERBURY 20, CONNECTICUT - SUBSIDIARY OF KENNECOTT COPPER CORPORATION

The Nation's Headquarters for Brass & Copper

Albany†	Chicago	Denver†	Kansas City, Mo.	Newark	Pittsburgh	San Francisco
Atlanta	Cincinnati	Detroit	Los Angeles	New Orleans	Providence	Seattle
Baltimore	Cleveland	Houston†	Milwaukee	New York	Rochester†	Waterbury
Boston	Dallas	Indianapolis	Minneapolis	Philadelphia	St. Louis	(†sales office only)

Remember — the trade marks "tt" and "TUBE-TURN" are applicable only to products of TUBE TURNS, INC.



Engineered

FOR MINIMUM PRESSURE DROP

THIS TUBE-TURN Welding Elbow has full radius conforming to A.S.A. Standard B 16.9. The radius is not reduced by tangents. The interior walls are consistently smooth and perfectly circular . . . important production features which minimize pressure drop.

This attention to engineering detail pays off in your piping systems. When you specify TUBE-TURN Welding Fittings and Flanges, pressure drop is at a minimum and uniformity of fit-up is assured.

You'll find a TUBE TURNS' Distributor in every principal city. Call him for good service in good connections.

Be sure you see the double "tt"

TUBE TURNS, INC. LOUISVILLE 1, KENTUCKY

DISTRICT OFFICES: New York · Philadelphia · Pittsburgh · Chicago · Houston · Tulsa · San Francisco · Los Angeles

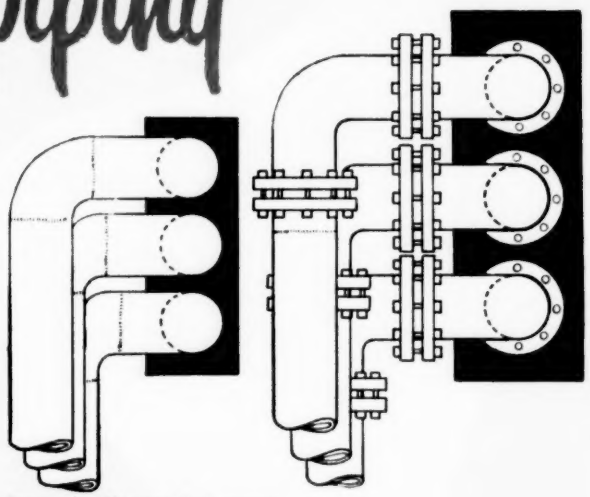
Wholly owned subsidiaries: TUBE TURNS OF CANADA LIMITED, CHATHAM, ONTARIO

PENNSYLVANIA FORGE CORPORATION, PHILADELPHIA, PA. · KEROTEST MANUFACTURING COMPANY, PITTSBURGH, PA.

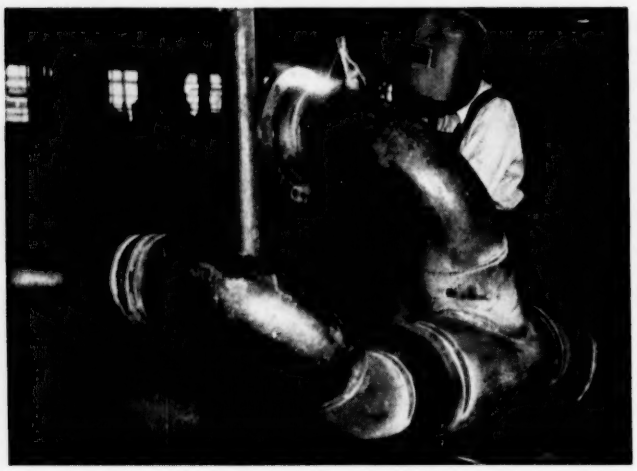
COMPACT *Welded piping* SIMPLIFIES THE JOB

You can simplify design, save valuable space and speed up the piping job by specifying *welded construction* with Tube-Turn Welding Fittings. Welded joints are virtually flush with the pipe. Pipes can fit snugly together in tight corners . . . against wall or ceiling . . . or around equipment. And welded piping requires little elbow room to install . . . and to insulate. The true circularity and uniform wall thickness of Tube-Turn Welding Fittings simplifies fit-up and assures a job well done under crowded working conditions.

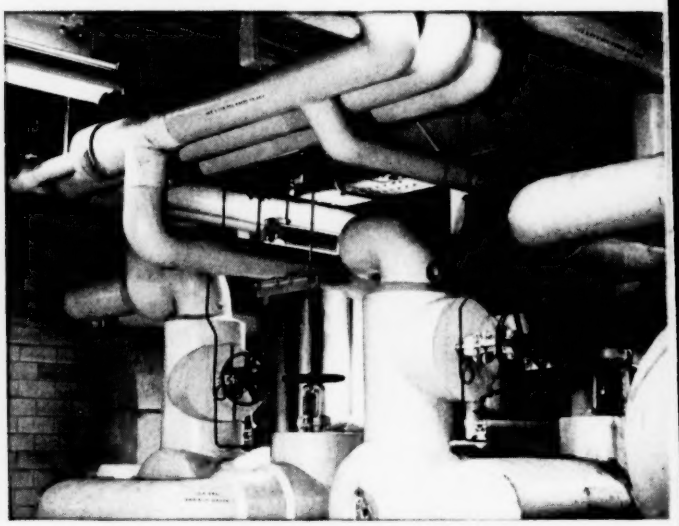
This is just one reason why it pays to specify *welded piping*. It's stronger, lighter, streamlined, economical to install, insulate and maintain.



Example: **The welded assembly on left takes a third less space than comparable flanged assembly.**



Bring on your tight corners! Entire sections of welded piping can be shop-fabricated and erected as a unit with a few simple tie in welds or flange connections to valves or containers.



In the new O. H. Hutchings Station of Dayton Power & Light Company. Piping for deaerators and feed water heaters is compact, streamlined and permanent. Directional changes are made with TUBE-TURN Welding Fittings.

TUBE TURNS, INC., Dept. B-2
224 East Broadway, Louisville 1, Kentucky

Your name _____

Position _____

Company _____

Nature of business _____

Address _____

City _____ *State* _____

DISTRICT OFFICES

New York	Houston
Philadelphia	Tulsa
Pittsburgh	San Francisco
Chicago	Los Angeles

"tt" and "TUBE-TURN" Reg. U. S. Pat. Off.

TUBE TURNS, INC.

LOUISVILLE 1, KENTUCKY

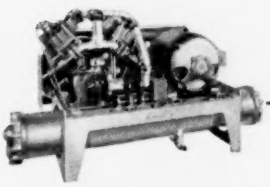
ONE OF THE MOST COMPLETE LINES IN THE INDUSTRY

NEW improved

Curtis CONDENSING UNITS at NEW, LOW PRICES

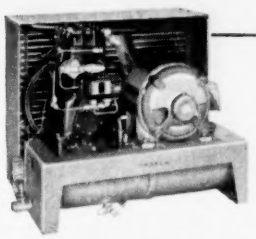
All with these Famous Curtis Features:

- TIMKEN TAPERED ROLLER BEARINGS
- POSITIVE LUBRICATION
- OIL LEVEL SIGHT GLASS
- SLOW SPEED OPERATION FOR LONG LIFE AND HIGH EFFICIENCY



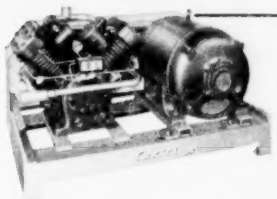
WATER COOLED CONDENSING UNIT

Low, Regular and High Temp., from ⅓ H.P. to 50 H.P.



AIR COOLED CONDENSING UNIT

Self-contained, remote, truck type, from ¼ H.P. to 3 H.P.



COMBINATION AIR AND WATER COOLED CONDENSING UNIT

Plenty of reserve capacity for extreme hot weather. Operates primarily as air cooled unit with shell and coil condenser as auxiliary in case of overload. From ⅓ H.P. to 3 H.P.

COMPRESSOR UNITS

For use with evaporative condensers, low temperature cooling, processing and air conditioning installations, from 3 H.P. to 50 H.P.

Plus a complete line of packaged units in six sizes 2-3-5-7½-10-15-H.P.

For Immediate Information — **Use This Coupon**

CURTIS REFRIGERATING MACHINE DIVISION
of Curtis Manufacturing Company
1999 KIENLEN AVENUE, ST. LOUIS 20, MISSOURI
I am interested in direct factory franchise. Send complete details.

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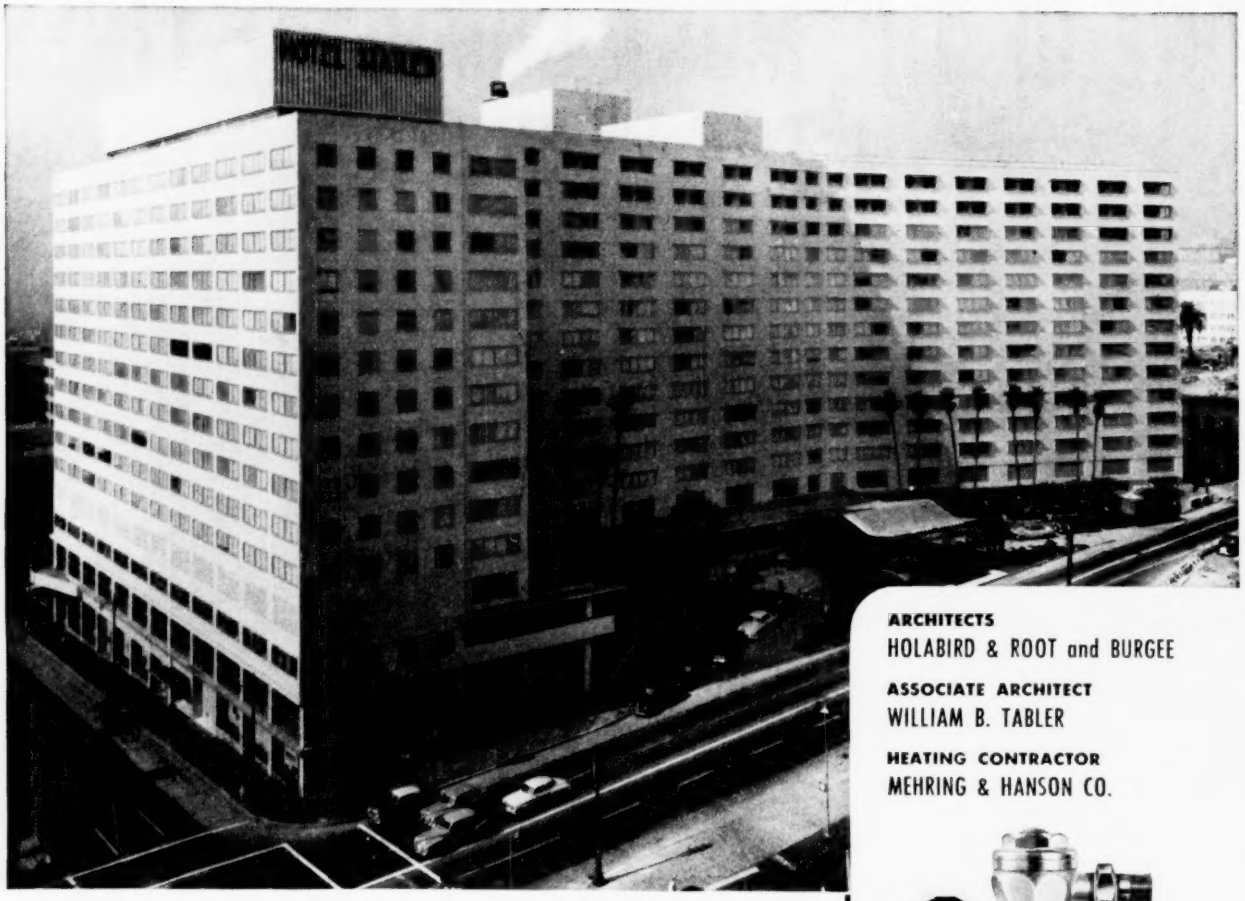

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HOLABIRD & ROOT and BURGEE

ASSOCIATE ARCHITECT
WILLIAM B. TABLER

HEATING CONTRACTOR
MEHRING & HANSON CO.

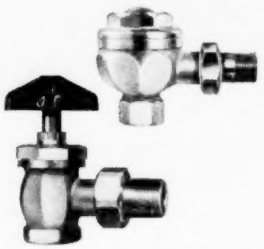
At the New Statler Center, Los Angeles

MARSH VALVES AND TRAPS

A lot of new thinking and long, hard planning went into this new Statler Center. It is a unique combination of hotel, office building, garage and shops all in one. It is distinctive alike for the open character of its design, and for the handling of such considerations as ventilation, heating and air conditioning.

The selection of Marsh valves and traps for such a building speaks for itself.

Long known and long respected, the Marsh line offers assurance of dependable service, year in and year out. For your very next job, learn first hand the advanced design and construction that have made Marsh valves, traps, vents and controls first choice for so many of the nation's finest buildings.



The Marsh metal-to-metal seal gives you packless valve construction at its finest. Perfect team-mate for it is the Marsh radiator trap. A large number of these were used in the New Statler.

This Marsh float and thermostatic trap is typical of a wide line of Marsh traps for all services.

MARSH HEATING EQUIPMENT CO. *Sales affiliate of Jos. P. Marsh Corporation*

Dept. U, Skokie, Ill.

MANUFACTURERS OF GAUGES • THERMOMETERS • WATER REGULATING VALVES • SOLENOID VALVES

SEE OUR EXHIBIT BOOTHS 1130-1132
Eleventh International Heating & Ventilating Exposition, Chicago

MARSH *Heating Specialties* **SINCE 1865**

Famous Labels suggest the choice

Many of the big textile mills . . . names your wife will recognize . . . "air-control" many of their manufacturing operations with Worthington air conditioning and refrigeration.

And many of the famous shops where the mills' products are sold . . . Saks Fifth Avenue, The Higbee Company, J. L. Brandeis, Lane Bryant, many Sears Roebuck Stores . . . are air-conditioned by Worthington.

No other manufacturer makes so complete a line. A Worthington system is all Worthington-*made*—not just Worthington-assembled—assuring you of perfectly balanced operation and unit responsibility.

Call your local Worthington distributor today. Worthington Corp., Air Conditioning and Refrigeration Div., Harrison, N. J.

America's Leaders... in Many Businesses... Select

WORTHINGTON

A-2.9

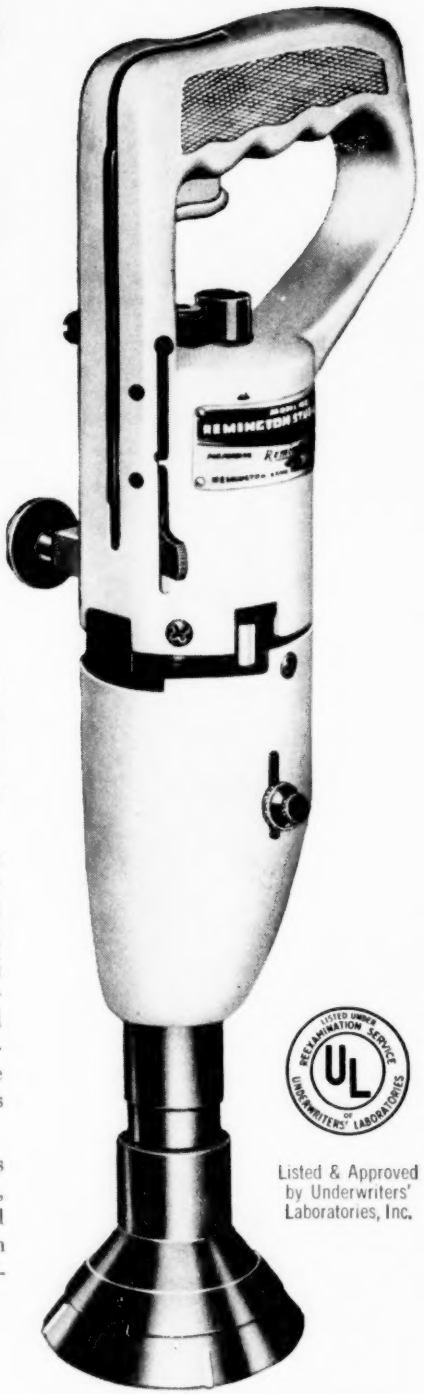
AIR CONDITIONING AND REFRIGERATION

The Most Complete Line... Always the Correct Recommendation

You can drive studs ARROW STRAIGHT into steel or concrete with

MODEL 450 REMINGTON STUD DRIVER

The widest power range of any powder-actuated tool!



The Model 450 Remington Stud Driver is the most efficient fastening method in use today. Its exclusive advantages are unequaled by any other powder-actuated tool.

You get consistently straight driving on every type of fastening job with the long heel cap on all Remington cartridges. It acts as a perfect gas seal and provides extra power. These colored heel caps clearly mark the six different 32-caliber power loads that are available. You can select the *right* cartridge for each job quickly and easily.

The Remington Stud Driver needs no separate parts for power control or loading—nothing to lose or break. Just a twist of the wrist opens the Model 450. Insert stud and power cartridge as a unit . . . close and you're ready. Triple safe, this superior tool has a separate lever that must be depressed and *held* with one hand before and during squeezing of the trigger with the other hand. Two *additional* devices prevent operation except in proper fastening position.

Completely self-powered, the Model 450 sets up to 5 studs per minute in fastening steel or wood structural pieces to concrete or steel surfaces. Its light weight—only 5½ pounds—makes it ideal for use overhead or in confined spaces. To speed operation further, an exclusive ejector snaps the fired case out of the tool instantly—no fumbling, no tools needed.

Test-proved to be the world's finest and speediest fastening system, the Model 450 Remington Stud Driver is made by Remington Arms Company, Inc., *America's oldest sporting arms manufacturer.*

Listed & Approved by Underwriters' Laboratories, Inc.

MAIL THIS COUPON TODAY

Industrial Sales Division, Dept. HV-2
Remington Arms Company, Inc.
939 Barnum Ave., Bridgeport 2, Connecticut

Please send me my *free* copy of the new booklet showing how I can cut my fastening costs.

Name _____

Position _____

Firm _____

Address _____

City _____ *State* _____

NEW, FREE BOOKLET shows you a hundred different ways the Model 450 Remington Stud Driver can speed *your* construction fastening. Packed with illustrations, it tells you where and how this tool can save time, reduce fatigue and cut costs. Send in the coupon below for your copy.

"If It's Remington—It's Right!"

Remington DUPONT

how to move air without FAN-FARE

use

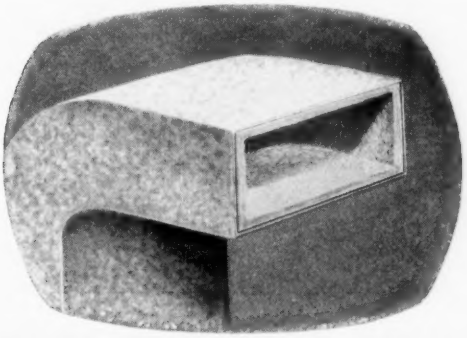
ULTRALITE

DUCT INSULATION and DUCT LINER

ULTRALITE Duct Liner reduces fan chatter to a w-h-i-s-p-e-r — and it's so easy to install! The long glass fiber captures and absorbs fan noise, lets heating and air conditioning systems run at peak efficiency without disturbing anyone.

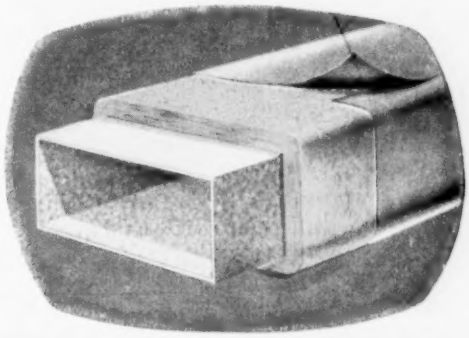
And ULTRALITE Duct Liner is easier and more economical to install than any liner you've ever used! You can cut it with a knife . . . run it quickly around curves and corners . . . fasten it securely in place with cement or screws and washers.

For the same good reasons, you'll want to use ULTRALITE Duct Insulation. It goes on faster, cheaper, and does a better job of keeping heat and cold where they belong. You have a choice of *4 attractive vapor barrier facings*, one of which is tailor-made for your particular condensation problem.



ULTRALITE—the duct liner that won't burn!

Ultralite Duct Liner is a flexible, semi-rigid glass fiber insulation designed specifically as an acoustical duct liner, with excellent sound-absorbing properties. It won't break, chip or delaminate—won't flake off in air stream! You can run it quickly around curves and corners, run it through the brakes and shears with the metal, fasten it in place with screws and washers or adhesives.



ULTRALITE—the easy-to-install duct insulation!

It's "duct soup" to wrap air ducts with Ultralite Thermal Duct Insulation—it's as easy as wrapping a package! Ultralite Duct Insulation is available plain or with your choice of 4 different vapor barrier facings, already adhered to the insulation. Ultralite is non-irritating, pleasant to handle, fire-resistant and non-corrosive to metals. K-factor is very low—and so are applied costs!

See Sweet's File (Architectural) or the Yellow Pages for name and address of your local Ultralite distributor.

GUSTIN-BACON MANUFACTURING CO.

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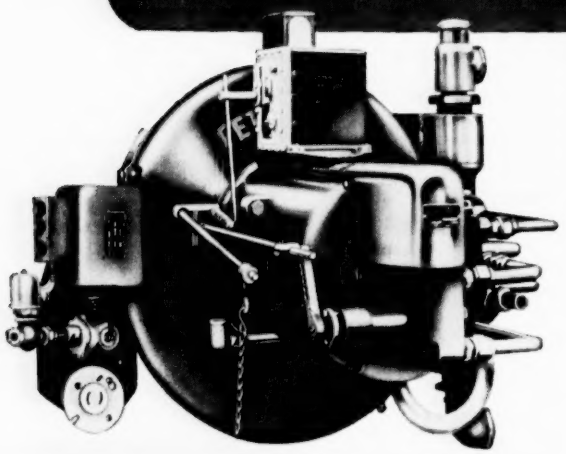
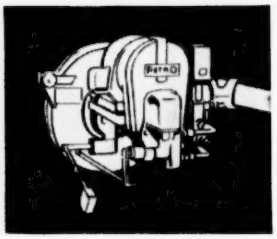
New York • Chicago • Philadelphia • San Francisco • Los Angeles • Houston • Tulsa • Fort Worth • Detroit

This contractor knows where he's going!

Petro oil firing



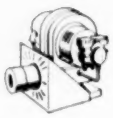


INDUSTRIAL OIL BURNERS
Rotary type. Burn low cost heavy fuel oil with complete reliability. Models for every industrial need. Capacities to 600 b.h.p.

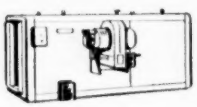
COMBINATION OIL-GAS
The perfect answer to fuel shortages or price advantages. Install in most any boiler. Switch fuels at a moment's notice.

Complete line for Home Heating

Furnaces and Boilers
Made in popular sizes to fit the heating needs of homes from 4 to 10 rooms. Extremely compact and attractive. Real fuel savers.



Conversion Units
Available for home and commercial use. Give unusual efficiency and fit in most any furnace or boiler. Capacities up to 20 gallons per hr.



Horizontal Furnace
Hang it or hide it—fits anywhere. Available in 5 models from 80,000 to 180,000 Btu's. Install in attic, basement, utility room or crawlway.

HEATING CONTRACTORS CHOOSE PETRO OIL FIRING BECAUSE THEY KNOW IT'S DEPENDABLE

CONFIDENCE — You *know* that a Petro will "do the job." You *know* that a Petro will deliver exceptional fuel economy. You know, and your customers know, that you have installed the best!

EASILY INSTALLED — Petro models are compact and well built. Sound and solid construction, easy access to oil and ignition lines and protected wire connections make Petro a favorite.

SIMPLE, DEPENDABLE PERFORMANCE — Petro oil burners are not complicated by "gadgets." They are simple, dependable units that demand no pampering service.

AUTOMATIC OPERATION WITH FLUCTUATING LOADS — Petro oil burners are almost instantly responsive and are therefore especially efficient for automatic modulated firing.

see our catalog in S ARCHITECTURAL FILE or write for copy

WRITE FOR COMPLETE INFORMATION

INDUSTRIAL-COMMERCIAL-RESIDENTIAL OIL BURNERS FOR EVERY FIRING NEED

PETRO

50 YEARS OF LEADERSHIP IN AUTOMATIC HEATING

3192 WEST 106th STREET • CLEVELAND 11, OHIO

LATEST TESTS add a

3rd Important NEW USE

for **SPORLAN** *Catch-All*

FILTER-DRIERS

on Comfort Cooling and Air Conditioning installations

1. FILTERING INSTEAD OF STRAINING

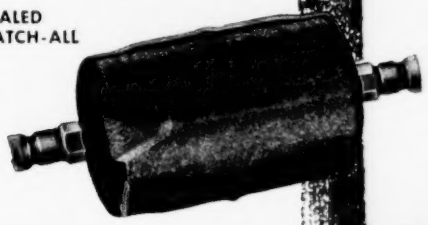
2. DRYING

3. ACID REMOVAL

Everyone knows...

the tremendous advantages Catch-Alls have over ordinary strainers and driers for perfect filtering and drying. But recent tests prove that in addition Catch-Alls remove the harmful corrosive acids which cause the most serious problems in refrigeration systems today! Acids also attack hermetic motor windings, causing costly burnouts. Guard against these failures by always installing Catch-Alls!

SEALED CATCH-ALL



Here Are The 5 Exclusive Catch-All Filter-Drier Features that will give you really clean, really dry, acid free refrigeration systems

1. They cannot powder!

2. They cannot pack!

3. The refrigerant cannot channel around the desiccant!

4. The unique, porous Catch-All cores are molded of minute particles of a highly efficient desiccant, the efficiency of which is greater than that of the same desiccant in granular form. 100% activation after complete assembly, then sealed with moisture proof seals.

5. They dry down to a low end point . . . a point so low that any remaining moisture is absolutely harmless!

SEALED CATCH-ALL

Don't settle for just any strainer or drier when there's a job to be done in air conditioning or comfort cooling.

REPLACEABLE CORE CATCH-ALL

DEMAND A SPORLAN CATCH-ALL FILTER-DRIER AND GET PEAK PERFORMANCE RIGHT DOWN THE LINE

Send for YOUR NEW CATCH-ALL BULLETINS *Today!*

SPORLAN VALVE COMPANY

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89 BROAD STREET NEW YORK 4, N. Y.

Keeping Pace with PLASTICS!

ROTO-CLONE sets dust-control pattern for both primary producers and fabricators

Plastics are going places! New materials—new applications are being developed daily. Dust problems have multiplied for primary producer and fabricator alike.

And the solution is the same as it has been for other of America's basic industries—AAF ROTO-CLONE* Dust-Control Equipment. In primary production, ROTO-CLONES exhaust the fine chemical dust from such operations as ball mill grinding, material handling and packaging. At point of fabrication, ROTO-CLONES again take over the complete dust collection job during molding and, later, on products finishing operations such as sanding, grinding, buffing, burnishing, machining, gear cutting, sawing and drilling.

Pictured above are two typical ROTO-CLONE applications in the plastics department of Allen-Bradley Co., Milwaukee, Wis., makers of motor controls. Main illustration shows battery of four molding machines from which dust is exhausted by a No. 12 Type D ROTO-CLONE. Inset pictures a finishing barrel which has been effectively hooded for removal of dust by another Type D unit.

The plastic industry is but one of many volume dust producers who value the constructive services of AAF engineers — the proven performance of ROTO-CLONE equipment. Whatever you produce, if dust is a problem —we'll take over from there. Call your local AAF representative or write direct.

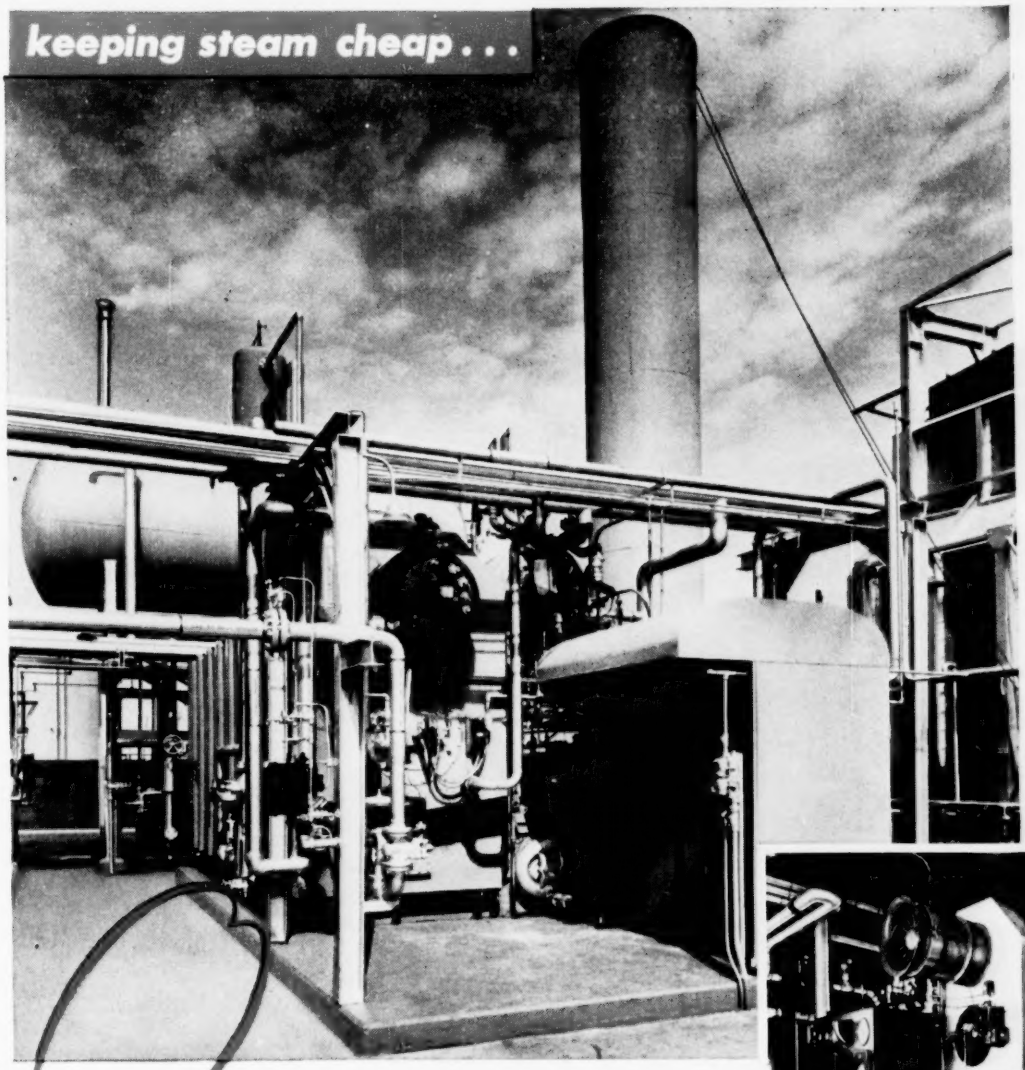
★ ★ ★

*ROTO-CLONE is the trade-mark (Reg. U.S. Pat. Off.) of the American Air Filter Company, Inc., for various dust collectors of the dynamic precipitator and hydro-static precipitator types.

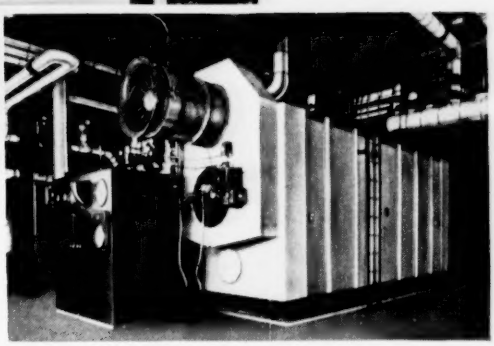
AAF

American Air Filter
COMPANY, INC.
294 Central Avenue, Louisville 8, Kentucky
American Air Filter of Canada, Ltd., Montreal, P. Q.

keeping steam cheap . . .



Outdoor installation of shop-assembled B&W Integral-Furnace Boiler, Type FM at a large Texas refinery.



Conventional indoor installation uses a minimum of valuable space.

Outdoors as well as indoors SAVE with the B&W Integral-Furnace Boiler, Type FM

Outdoor installation of the shop-assembled, *B&W Integral-Furnace Boiler, Type FM,* is an important cost-saving advantage that is gaining wide popularity with users in all sections of the country. A high percentage of units sold to date are for outdoor operation under year-round weather conditions.

A completely water-tight, rigid steel casing encloses the entire boiler and furnace of this compact B&W steam unit. Designed to permit proper expansion and contraction of the unit's various components resulting from seasonal temperature fluctuations, the casing is welded for additional strength and tightness. A blanket of mineral wool plus over-all high-temperature insulation of walls, floor, and roof, minimizes heat loss through radiation.

For installation outdoors or indoors, this versatile, self-contained B&W steam generator is available in steam capacities ranging from 2900 to 28,000 lb per hr, at pressures between 15 and 250 psi. Total steam capacity of units now in service and on order for over 50 different industries, utilities, and other users here and abroad exceeds 5½ million lb per hr.

OTHER COST-SAVING FEATURES

- Saves Erection Time and Cost
- Meets Wide Range of Service
- Handles Quick Load Changes
- Fast Steaming
- Low Maintenance
- Easy Accessibility
- Burns Oil and/or Gas
- Saves Fuel
- Saves Space
- Safe, Automatic Operation

BABCOCK & WILCOX

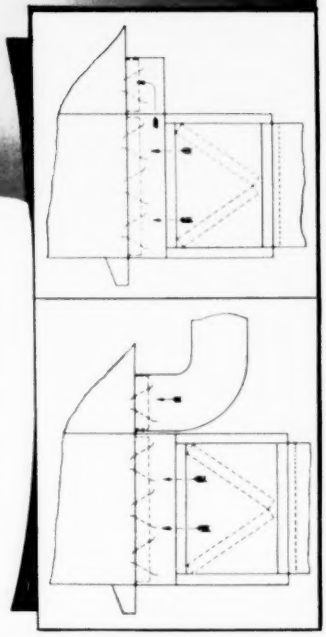
Write for Bulletin G-76, for an illustrated, detailed description of the many other cost-saving features of this unique unit. The Babcock & Wilcox Company, Boiler Division, 161 E. 42nd St., New York 17, N. Y.

G-586

KENNARD Engineered

SPECIAL WITH MANY STANDARD WITH KENNARD

Exposed View
Damper Co



Opposed-Acting Dampers

Architects, Engineers and Contractors prefer opposed-acting Dampers for these features:

Uniform increments of opening for each degree of rotation of the damper blades, assure air flow characteristics that simplify the control problem.

Balanced forces assure freedom from blade flutter.

Opposed-Acting Dampers are standard on all KENNARD air handling units.

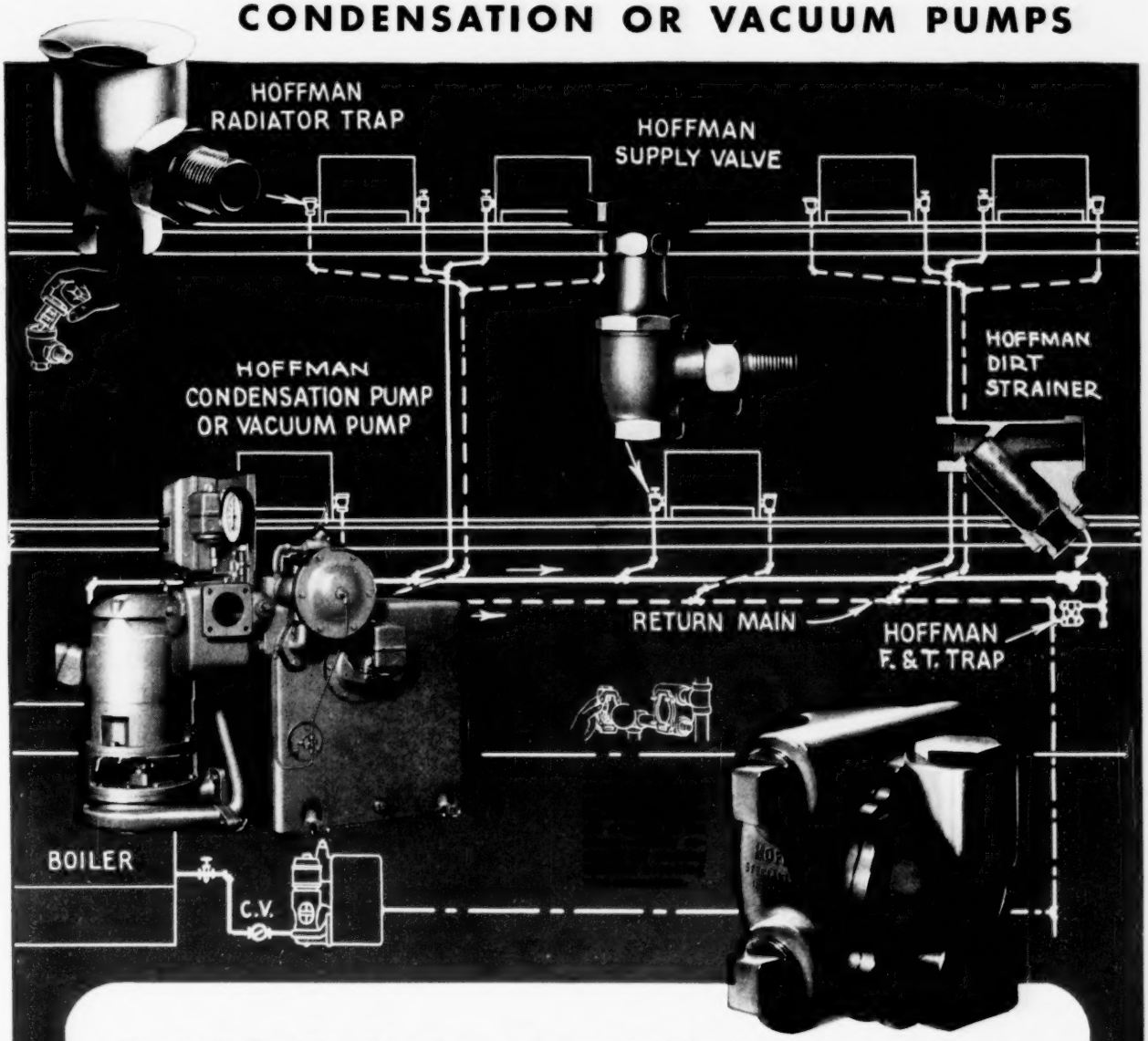
Another special feature by Kennard is a choice of By-Pass Arrangements, illustrated at right.

Write for name of nearest representative and catalogs needed.

KENNARD CORPORATION • 1823 S. HANLEY ROAD ST. LOUIS 17, MO., U.S.A.

HOFFMAN STEAM SPECIALTIES

FOR SYSTEMS REQUIRING TRAPS, CONDENSATION OR VACUUM PUMPS

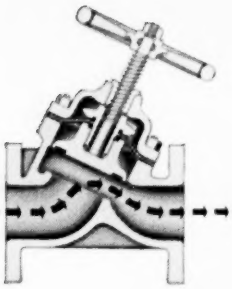


There's a Hoffman Trap, Valve, Pump or other specialty designed to give *better control* of every steam system requirement. And, *each* Hoffman product is distinguished by exclusive features that assure customer satisfaction, long, care-free service. *It's the* COMPLETE, *tested, quality line* backed by a dependable, single source of supply and responsibility. *Yet Hoffman Products cost no more than the ordinary kind.* To avoid delays—order now from your wholesaler of heating and plumbing supplies. Catalogs available on all items.

HOFFMAN STEAM SPECIALTIES

HOFFMAN SPECIALTY MFG. CORP., Dept. HV-2
VALVES, TRAPS, VACUUM AND CONDENSATION PUMPS, FORCED HOT WATER HEATING

1001 York St., Indianapolis 7, Ind.
SYSTEMS Sold by leading Wholesalers of Heating and Plumbing Equipment



FOR SAFER CONTROL ---------- OF HARD-TO-HANDLE FLUIDS

CRANE Packless Diaphragm Valves

Now Available in New Materials

WORKING PRESSURES—up to 150 pounds. Water, air, oil, or gas, 180 F. maximum temperature, depending on valve size and materials.

You asked for it—and now Crane gives you this outstanding Diaphragm Valve in a new wide choice of body, disc insert, and diaphragm materials—in unlined or lined patterns. Whichever is specified, Crane design gives you important advantages including—long diaphragm life . . . positive shut-off in case of diaphragm failure . . . less resistance to flow with minimum pressure drop . . . easy operation . . . simplified maintenance at lowest upkeep cost.

Full specification data is in your new Crane 53 Catalog—or ask your Crane Representative.

SCREWED ENDS, UNLINED Sizes ½ to 2 in.
Brass, Cast Iron, Aluminum, or 18-8 Mo body and disc. Furnished with neoprene, Buna N, and natural rubber diaphragm and disc insert.

FLANGED ENDS, UNLINED Sizes ½ to 6 in.
Cast Iron, Aluminum, or 18-8 Mo body and disc. Furnished with neoprene, Buna N, and natural rubber diaphragm and disc insert.

FLANGED ENDS, LINED Sizes 1 to 6 in.
Cast Iron body only. Lined with neoprene or hard natural rubber. Disc coated with neoprene or soft natural rubber.

•

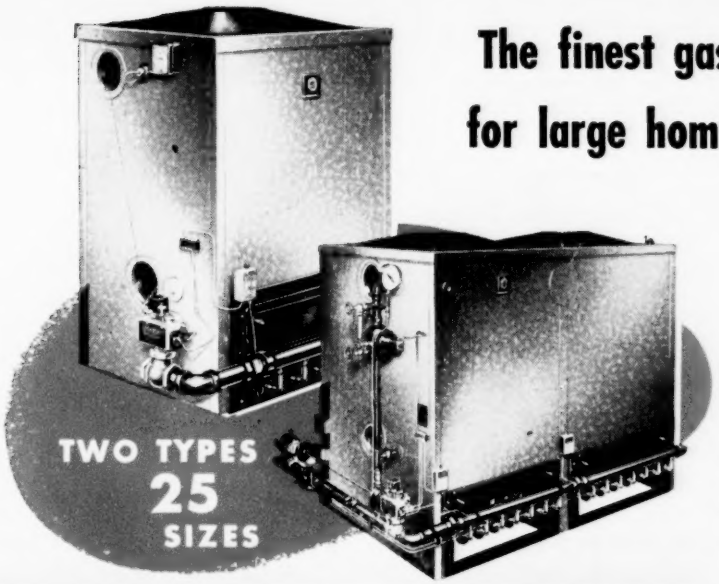
Other body and disc materials, as well as linings, available on special order. Also sliding stem valves for automatic operators of all types.

CRANE VALVES

CRANE CO., *General Offices:* 836 S. Michigan Ave., Chicago 5, Ill.
Branches and Wholesalers Serving All Industrial Areas

VALVES • FITTINGS • PIPE • PLUMBING • HEATING

The finest gas boilers on the market for large homes and larger buildings!



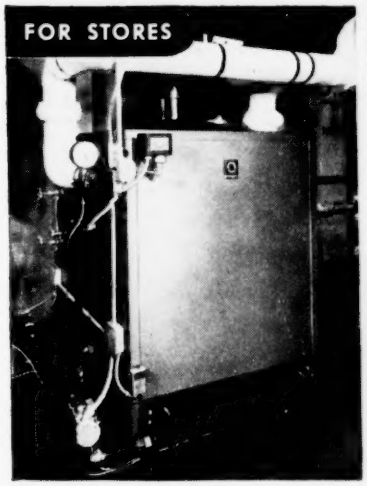
STANDARD BOILERS

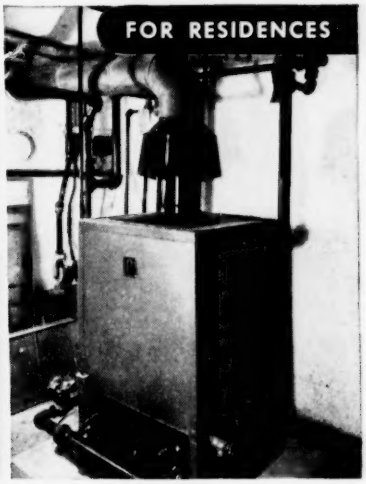
by AMERICAN-Standard

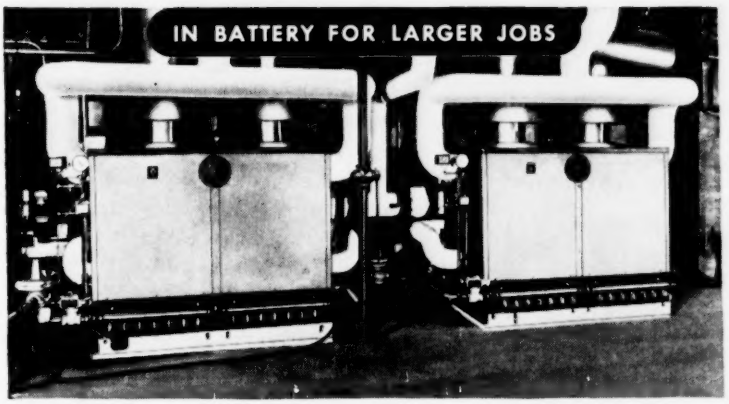
● Designed by experts in the field of gas heating, Standard boilers are outstanding examples of good engineering and manufacturing skill. Heating surfaces, burners, controls and other essential features are coordinated to assure maximum heat output with lowest operating and maintenance cost.

Made in two types—1-G and 4-G—and in twenty-five sizes, these top quality boilers provide effortless gas heating in large homes, apartment buildings, hospitals, and in various commercial and industrial buildings. Furthermore, they can be used in batteries in larger buildings to provide an extremely flexible heat source through the operation of one or more units, thus giving added economy in mild weather, as well as perfect comfort in the coldest weather.

Standard boilers and other gas fired heating equipment in the American-Standard line are sold through selected wholesale distributors to heating contractors. **American Radiator & Standard Sanitary Corporation,** P.O. Box 1226, Pittsburgh 30, Pa.







Precision-machined and sub-assembled to facilitate quick and easy installation

Standard boilers have cast-iron sections which are precision-machined to facilitate quick and easy assembly. Individual sections may be conveniently carried through any ordinary doorway. To save further time and labor, controls, valves, and control piping are factory-assembled as far as possible.

NEW DATA BOOK Now Available!

A comprehensive, instructive manual to help you select and install any type of radiator heating equipment in the American-Standard line. Ask your wholesaler for your copy. Form No. 220.

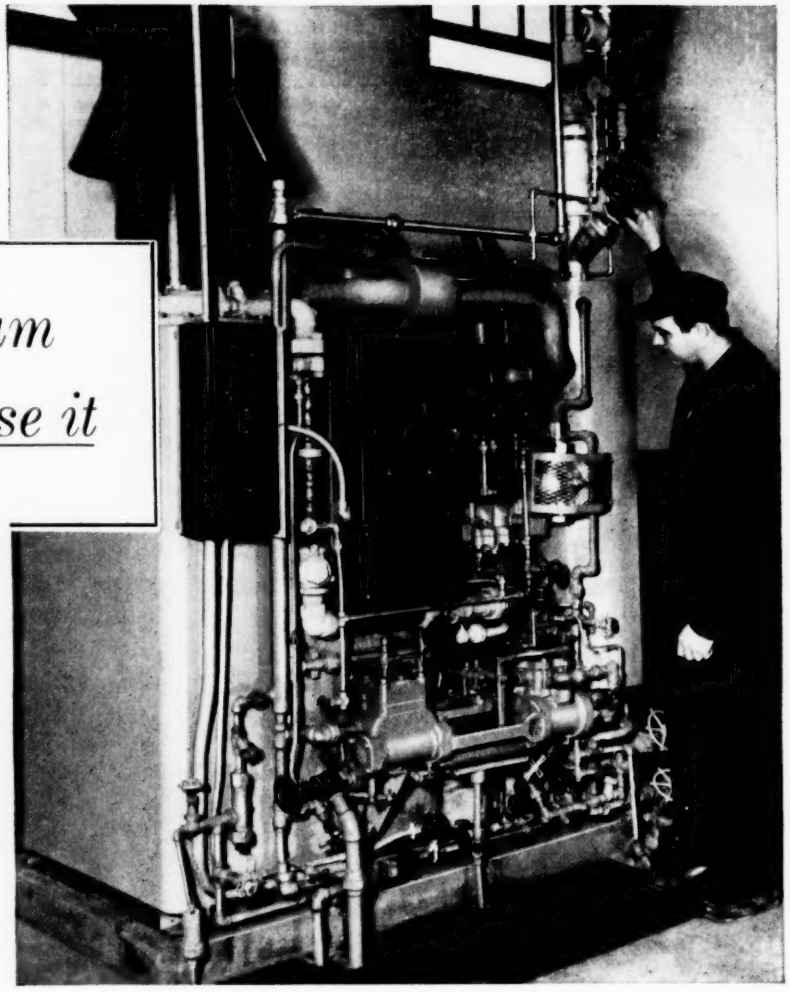
AMERICAN-Standard HEATING

Serving home and industry

AMERICAN-STANDARD • AMERICAN BLOWER • CHURCH SEATS & WALL TILE • DETROIT CONTROLS • KEWANEE BOILERS • ROSS EXCHANGERS

Make your steam
where you use it
with this . . .

PUSH-BUTTON STEAM PLANT



Just push the button — and in a matter of minutes the C-E Re-circulation Steam Generator will give you up to 6,000 pounds of steam per hour at up to 300 psi. That's just about all there is to it.

For the C-E Re-circulation Steam Generator is more than a package boiler — it is a fully integrated, fully automatic, steam plant complete with all controls and accessories, and it takes a minimum floor space . . . about the same as two office desks.

If you have a space 7 feet square by 8 feet high and you need steam for . . .

. . . remote spots not served by present steam lines, or involving long, wasteful pipe lines

. . . occasional loads that exceed the capacity of your present steam generating equipment

. . . highly fluctuating loads and those involving sudden heavy demands

. . . any conditions requiring maximum output from minimum space, with minimum attention.

If you do — or wherever you need a compact . . . reliable . . . automatic source of steam for heat or process — don't just buy a boiler — investigate the C-E Re-circulation Steam Generator. You'll find further details in bulletin p-323a. May we send you a copy?

IF COAL IS YOUR FUEL . . .

. . . investigate the C-E Skelly Stoker for best results with either bituminous or anthracite.

COMBUSTION ENGINEERING — SUPERHEATER, INC.

200 Madison Avenue • New York 16, N. Y.

B-581

ALL TYPES OF BOILERS, FURNACES, PULVERIZED FUEL SYSTEMS AND STOKERS; ALSO SUPERHEATERS, ECONOMIZERS AND AIR HEATERS

TYPHOON HANDS YOU THE KEY TO A

new billion-dollar market

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SIZES

WITH

Cooling-Heating Units

FOR THE HOME

Take a quick survey today. How many new homes going up in your area? How many old homes already have warm air ducts? It adds up to a boom market for year-round air conditioning — and it's yours with Typhoon Model S-W!

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43 YEARS OF COMFORT ENGINEERING IN THESE EXCLUSIVE TYPHOON FEATURES!

ONLY TYPHOON has one-button control — summer or winter, a touch of a button brings cool air or warm . . . automatically!

ONLY TYPHOON has an all-copper condenser—it defies rust and corrosion, gives trouble-free service.

ONLY TYPHOON is a miracle of compactness—takes up less space than any other unit, can even fit into a standard closet!

ONLY TYPHOON has *completely* automatic changeover design—for switching from heating to cooling; no dampers to manipulate!

SIMPLE TO INSTALL—Just a few quick connections and within hours your Typhoon unit is ready to function.

INEXPENSIVE TO OPERATE—Engineered to the point of greatest economy consistent with dependable performance.

QUIET—Completely insulated heavy-gauge steel cabinet and floating spring base assure whisper-quiet operation.

A.G.A. APPROVED. Perfected, Tested and Factory-Guaranteed by Typhoon.

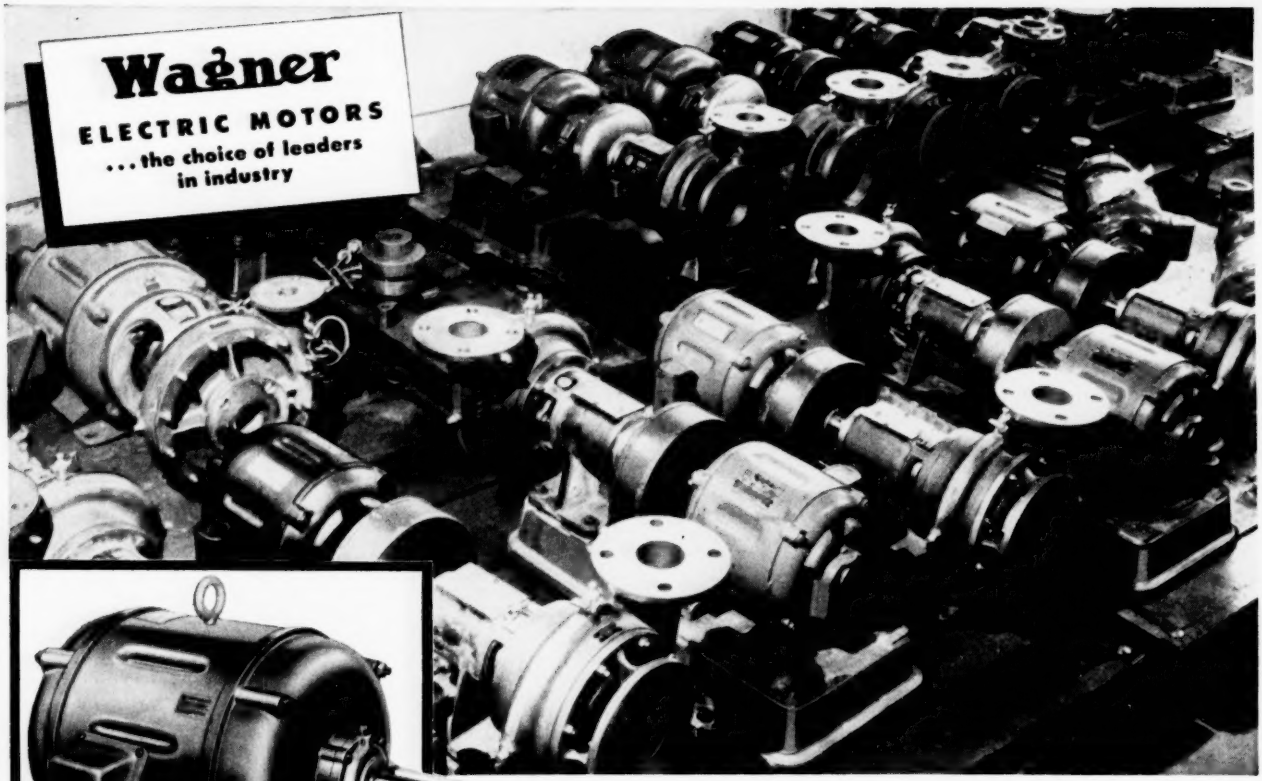
Year-Round Air Conditioning
With ONE CENTRAL UNIT
Fully Automatic

A TYPHOON S-W FRANCHISE

is your key to this great new home market — write, wire, phone for information today.

TYPHOON AIR CONDITIONING CO. INC., 794 Union Street, Brooklyn 15, N. Y.

Specialists in Air Conditioning Since 1909.



Wagner Motors furnish plenty of power for pumps

Motors that drive pumps and compressors need plenty of electrical and mechanical stamina to hold up under the hard, steady grind expected of them.

Fitting the right motor to your pumps is not a problem of special motor designing and building, but of choosing a standard Wagner Motor suited to the job. Wagner Motors are diversified in design and can be readily adapted to a wide range of pump applications.

Wagner Motors are chosen for thousands of pumps because they can deliver plenty of sure, easy, continuous power. They require very little attention—Wagner Motors are designed to keep maintenance at a minimum. They give the kind of service you want—more than sixty years of motor building experience stands behind every motor bearing the Wagner name.

Improve the performance, economy and dependability of your product by choosing Wagner Motors. Bulletin MU-185 gives information on the complete line. Let a Wagner engineer discuss your motor needs with you. Consult the nearest of our 32 branch offices, or write us.

it's to your advantage to standardize with Wagner:

When you standardize on Wagner Motors—you get the advantages of a liberal warranty... of nationwide service facilities, with on-the-spot service, replacement motors and parts available from 25 Wagner-owned Service Branches and more than 750 Authorized Service Stations. You can choose from a wide variety of types and sizes (from 1/125 to 400 hp).

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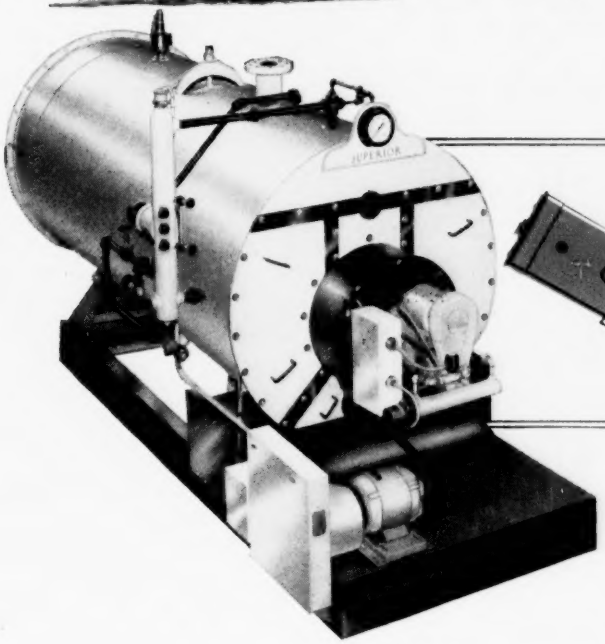
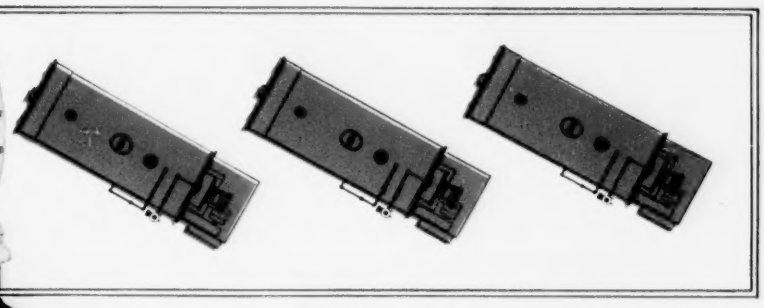
ELECTRIC MOTORS • TRANSFORMERS • INDUSTRIAL BRAKES
AUTOMOTIVE BRAKE SYSTEMS – AIR AND HYDRAULIC

BRANCHES IN 32 PRINCIPAL CITIES

M53-4

this is the plant . . .





Unusually compact arrangement allowed for the installation of all three units in a boiler room only 20' x 60'

. . . . where 3 SUPERIOR STEAM GENERATORS saved more than their cost in less than 2 years

Only four years ago, this plant was inadequately heated with coal at a fuel cost (excluding labor) of approximately $44,000. per year. Three years ago, three Superior Steam Generators were installed with the following three results:

(1) Fuel costs were cut to $22,000 . . . and in less than two years, those Superior Steam Generators saved their total cost.

(2) The ability of those Superior Steam Generators to deliver their full rated capacities provided steam in excess of that required for heating . . . which was sold as process steam to further reduce the cost of operation.

(3) Because of their compact design, a substantial saving in space resulted; and the space thus saved was profitably rented to still further reduce the cost of operation.

To meet increased demands for process steam, a fourth Superior Steam Generator has recently been installed.

This is but one of the many case studies which demonstrate the advisability of investigating the installation of Superior Steam Generators in your plant. For complete details write for Catalog 519.

Superior Steam Generators are fully automatic; burn oil, gas, or both. 18 sizes from 20 to 600 b.h.p. for pressures up to 250 p.s.i. or for hot water.

for performance you can **BANK** on

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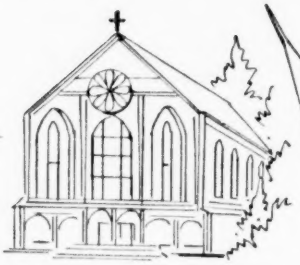
SUPERIOR STEAM GENERATORS

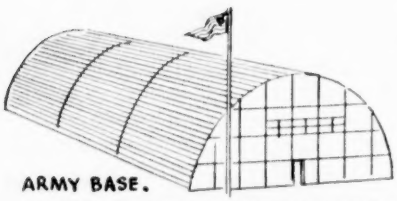
NOTES FROM AN ARCHITECT'S SKETCH PAD

LOOKS LIKE THAT VERSATILE DRAVO "COUNTERFLO" HEATER CAN BE USED ON PRACTICALLY ALL OUR JOBS.

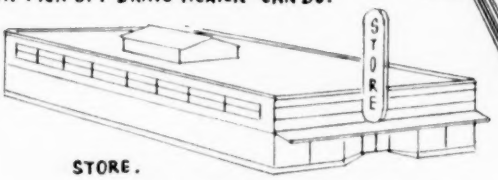
SCHOOL DISTRICT BUDGET LIMITED. CAN SAVE WITH DRAVO HEATERS.



CHURCH. INTERMITTENT HEATING. NEEDS QUICK PICK-UP. DRAVO HEATER CAN DO.

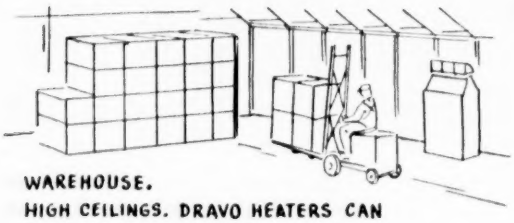


ARMY BASE.
WINTER CONSTRUCTION ON THESE BARRACKS. CAN INSTALL DRAVO HEATERS EARLY FOR HEAT DURING CONSTRUCTION AND AFTER COMPLETION.

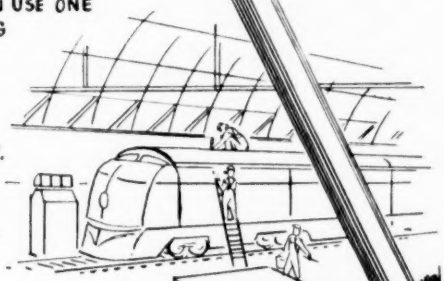


STORE.
WITH DRAVO HEATERS, CAN USE ONE SET OF DUCTS FOR HEATING AND AIR-CONDITIONING.

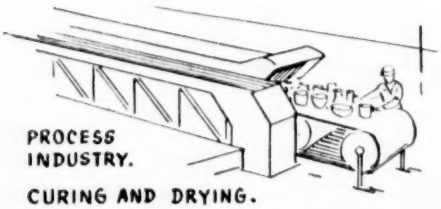
INDUSTRIAL PLANT.
DRAVO HEATERS HAVE 150' AIR THROW. NO DUCTS NEEDED.



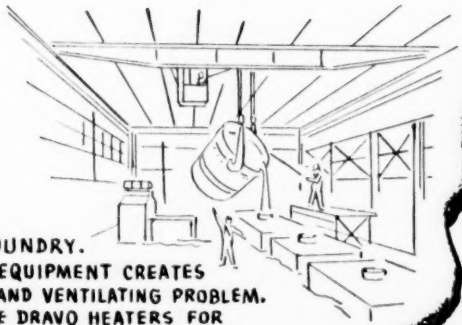
WAREHOUSE.
HIGH CEILINGS. DRAVO HEATERS CAN REDUCE ROOF HEAT LOSS, KEEP HEAT WHERE IT'S NEEDED.



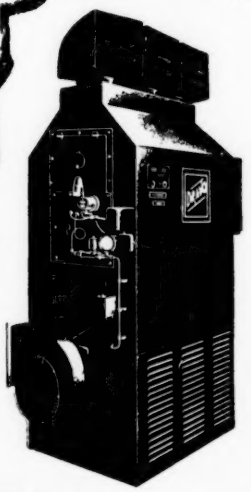
DIESEL RAILROAD SHOP.
NEEDS HEAT AT WORKING LEVEL.
DRAVO HEATERS IDEAL.



PROCESS INDUSTRY.
CURING AND DRYING.
SPECIFY DRAVO HERE.



FOUNDRY.
EXHAUST EQUIPMENT CREATES HEATING AND VENTILATING PROBLEM.
USE DRAVO HEATERS FOR TEMPERED "MAKE-UP" AIR.



...kin
...v Dravo.

A case study on any ... installations is yours for the asking. For complete information on how Dravo "Counterflo" Heaters can help solve your heating problems, write for Bulletin LM-526-3

DRAVO CORPORATION

HEATING DEPARTMENT, DRAVO BUILDING, PITTSBURGH 22, PA.

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JOY AXIVANE* FANS

WITH JOY AXIVANE Fans, you profit by the greater efficiency, quieter and smoother operation, and lower power consumption of their vaneaxial design. You save on installation, too. These light, compact, in-line fans mount directly in the air duct—saving space and time, making foundations, guards, etc. unnecessary. What's more, the important adjustable-blade feature of JOY Fans gives you extra flexibility—permits easy adjustment on the job to suit new conditions or compensate for faulty duct work. ● Let us show you how to get *best* ventilating results!

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Consult a Joy Engineer

WAD 1.2358

* *Reg. U.S. Pat. Off.*

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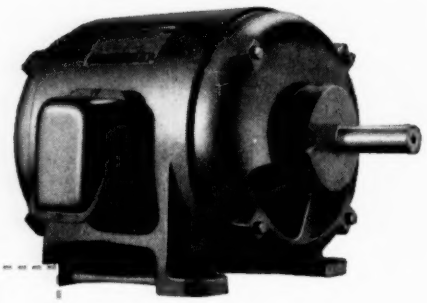
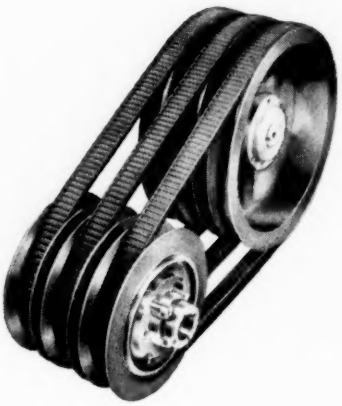
If Your Problem IS HERE

Between Power

ALLIS-CHALMERS





Motors Smooth running and quiet operating. Cast iron frames resist corrosion in humid atmospheres. Double shielded bearings do not ordinarily require lubrication but may be lubricated in service if desired. Sleeve bearing motors available in many sizes if required.

Sizes from ½ hp up. Types include single and multi-speed squirrel-cage, dc, wound-rotor and synchronous. Enclosures include drip-proof, splash-proof, totally-enclosed, non-ventilated, totally-enclosed fan-cooled and explosion-proof. Totally-enclosed and explosion-proof motors built in famous finned design which greatly reduces cleaning problems and costs, or in the tube-cooled design which gives the same maintenance savings in the larger sizes.

TEXROPE Drives — The original multiple V-belt drive and the most complete line of V-belt drive products in the industry. *Super-7* V-belts feature grommet construction in all but the smallest sizes. Also available in high-capacity, oil-resisting, static-conducting type.

Variable speed sheaves for fans and pumps provide a simple, inexpensive method of controlling output. Saves time in balancing systems, simplifies seasonal adjustments. Allis-Chalmers variable speed sheaves include *Vari-Pitch* sheaves for stationary or motion control with both standard and wide range adjustments.

Constant speed sheaves include *Texsteel* sheaves and *Magic-Grip* easy mounting sheaves in a complete range of sizes.

SEND COUPON

Allis-Chalmers Mfg. Company
Milwaukee 1, Wisconsin

Please send me more information on Allis-Chalmers coordinated equipment.

- ☐ Motors — Bulletin 52B6052
- ☐ Control — Bulletin 14B7132
- ☐ *Texrope* V-belt Drives — Bulletin 20B6051

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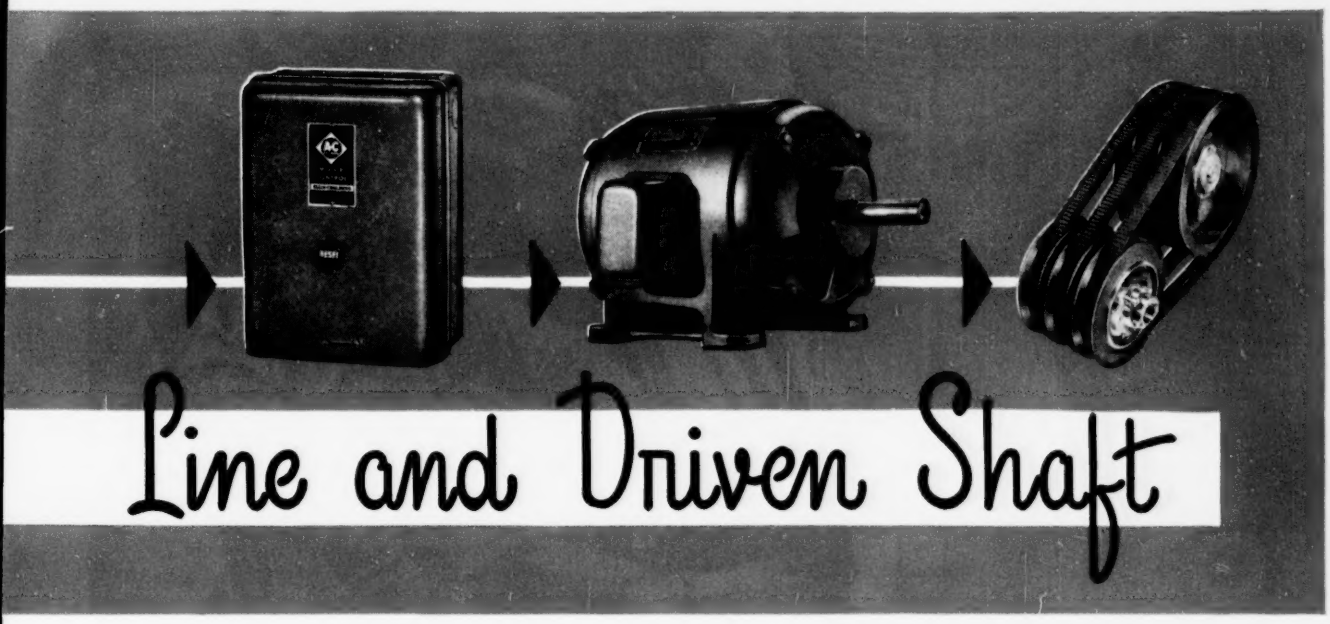
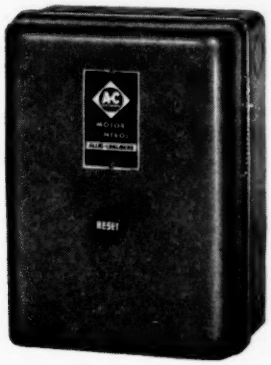


Line and Driven Shaft

CAN HELP YOU



Control — There is an Allis-Chalmers control to meet every requirement of motor operation through the complete range of motor sizes. Manual and magnetic, reversing and non-reversing, across-the-line and reduced voltage starters are included. Push button and pilot devices are available in any number of positions and in all combinations. Accessory Allis-Chalmers control equipment includes dc contactors, timing relays, contactors for heavy duty starting and rotary control switches.

YOU CAN SAVE TIME, SAVE WORK, SAVE MONEY and be sure of your fan, pump and compressor drives when you use coordinated components from Allis-Chalmers. For Allis-Chalmers can supply you with control, motor and *Texrope* V-belt drive for your machine . . . all of integrated design and manufacture.

Unit Responsibility

By using Allis-Chalmers coordinated drive components, you save paperwork and the time and cost of matching parts from different sources. More important, you know the components will fit together properly . . . that assembly will be completed quickly and easily.

And you don't have to worry about passing the buck on service. Allis-Chalmers stands behind the complete drive and takes responsibility for the proper functioning of every part.

Delivery from Stock

Immediate delivery from stock can be had on nearly all standard items from warehouses and distributor stocks located all over the country.

Allis-Chalmers representatives are experienced in air conditioning problems and can give you the kind of help you need in selecting the best drive for your machine. And this team of field experts is backed up by a large factory engineering staff.

Certified Service

Allis-Chalmers continues to serve you after the sale with nearly a hundred Certified Service Shops located in every industrial area in the country. Allis-Chalmers Certified Service Shops are carefully selected independent service shops that use only factory-approved parts and methods in complete servicing of Allis-Chalmers equipment.

Texrope, Texsteel, Magic-Grip, Vari-Pitch, and Super-7 are Allis-Chalmers trademarks.

ALLIS-CHALMERS

We can learn from bankrupt Micawber

"MY advice, Copperfield, you know. Annual income twenty pounds, annual expenditure nineteen-nineteen-six, result happiness. Annual income twenty pounds, annual expenditure twenty-ought-six, result misery. The blossom is blighted, the leaf is withered—in short you are forever floored. As I am!"

This is probably the most famous financial counsel in all English literature, offered a hundred years ago by Charles Dickens' character the bankrupt Micawber to the hero David Copperfield. As advice it is just as good in 1953 as it was in 1849, and just as sound for a nation as for an individual.

In 17 of the last 20 years, Uncle Sam has followed Micawber's practice, not his advice. Our national balance sheet has been, figuratively, "annual income twenty pounds, annual expenditure twenty-ought-six". Ahead of us as a nation, if we continue this irresponsible policy, is Micawber's dire predicament, "blossom blighted, leaf withered—forever floored".

There is no sane reason why the world's richest nation should continue to live the financial life of a profligate bankrupt. It is time now to set our house in order. The program called for is simple: (1) Eliminate waste and extravagance in government spending; (2) Balance the Federal budget; (3) Control the national debt and reduce taxes.

By such positive action we can protect future happiness—and prevent misery—for ourselves, our children and our children's children.

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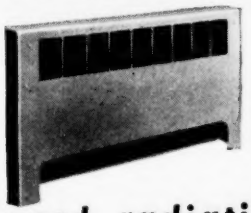
WOW!

profits are rolling in

This action picture is a profit picture of men who handle and install Fedders heating products. Fedders heating equipment is efficient, easily stocked, easily handled, easily sold and easily installed. Nationally advertised to architects, contractors and home owners. Sizes and types for every residential, commercial, industrial and institutional requirement. You get the best and profit most with Fedders products. Send coupon for your personal copy of the latest Fedders catalogs.

FEDDERS

convector-radiators



baseboard radiation

wall radiation

unit heaters

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Please send me latest catalogs on Fedders heating equipment.

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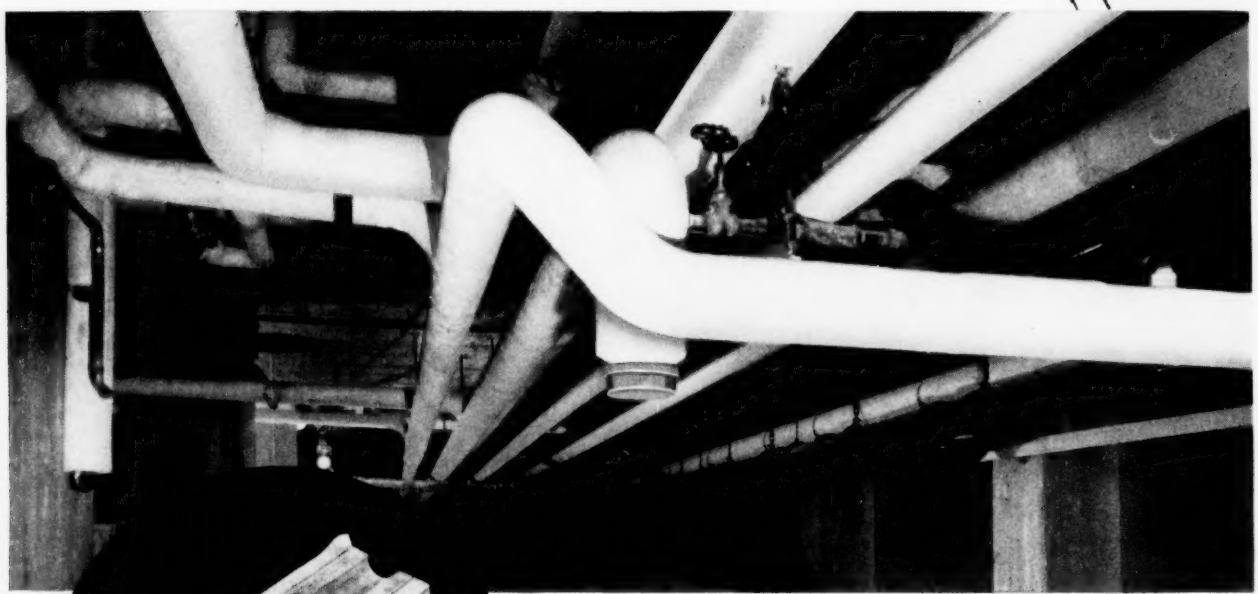
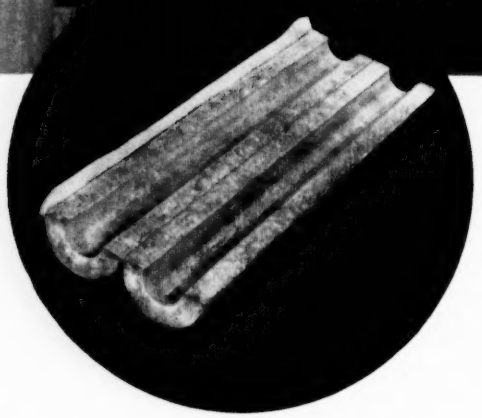
take a long look at the insulation you never have to look after.... Amocel





That's right! Unarco Amocel is as maintenance-free as an insulation can be—light, strong, durable ,efficient. It's unharmed by moisture, steam, fumes; withstands impact and vibration; may be removed and reused repeatedly without damage or efficiency-loss.

Amocel, a Unarco exclusive, brings to commercial insulation applications many of the excellent features already made famous by Unarco Unibestos—the higher-temperature stand-out. You'll like its easy installation, its clean appearance, its year-after-year effectiveness.

UNARCO

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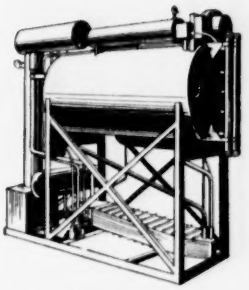
the dependable air conditioning equipment

He can rest assured because Servel has a well-deserved reputation for reliability and economy in meeting all air conditioning needs—comfort air conditioning, chilled water for industrial processing, precooling air for industrial applications.

Reliability—Because Servel Air Conditioning has *no moving parts* in the refrigeration system, there is nothing to vibrate or wear. It operates continuously at peak performance without loss of capacity and with minimum maintenance. A five-year factory warranty backs up the dependability of the famous Servel "no moving parts" design.

Economy—The Servel unit operates on steam at atmospheric pressure which can be obtained from any source—waste steam, waste heat or district steam. With simple controls, the Servel unit modulates to meet varying load conditions. Capacity can be reduced to as low as 50% with corresponding savings in steam consumption.



The Servel 25-ton water chiller has low floor loading, no vibration and quiet operation. It can be installed on any floor with most economical piping arrangement.

Investigate the proved advantages of Servel . . . There's a Servel unit or combination that will provide the best *in air conditioning at the lowest operating and upkeep cost. Mail the coupon* today *for full information.*

Servel

the name to watch for great advances in

AIR CONDITIONING ✓ REFRIGERATION

SERVEL, INC., DEPT. HV-2, Evansville 20, Indiana

Send me further information about Servel Air Conditioning equipment for:

☐ Comfort air conditioning ☐ Industrial applications

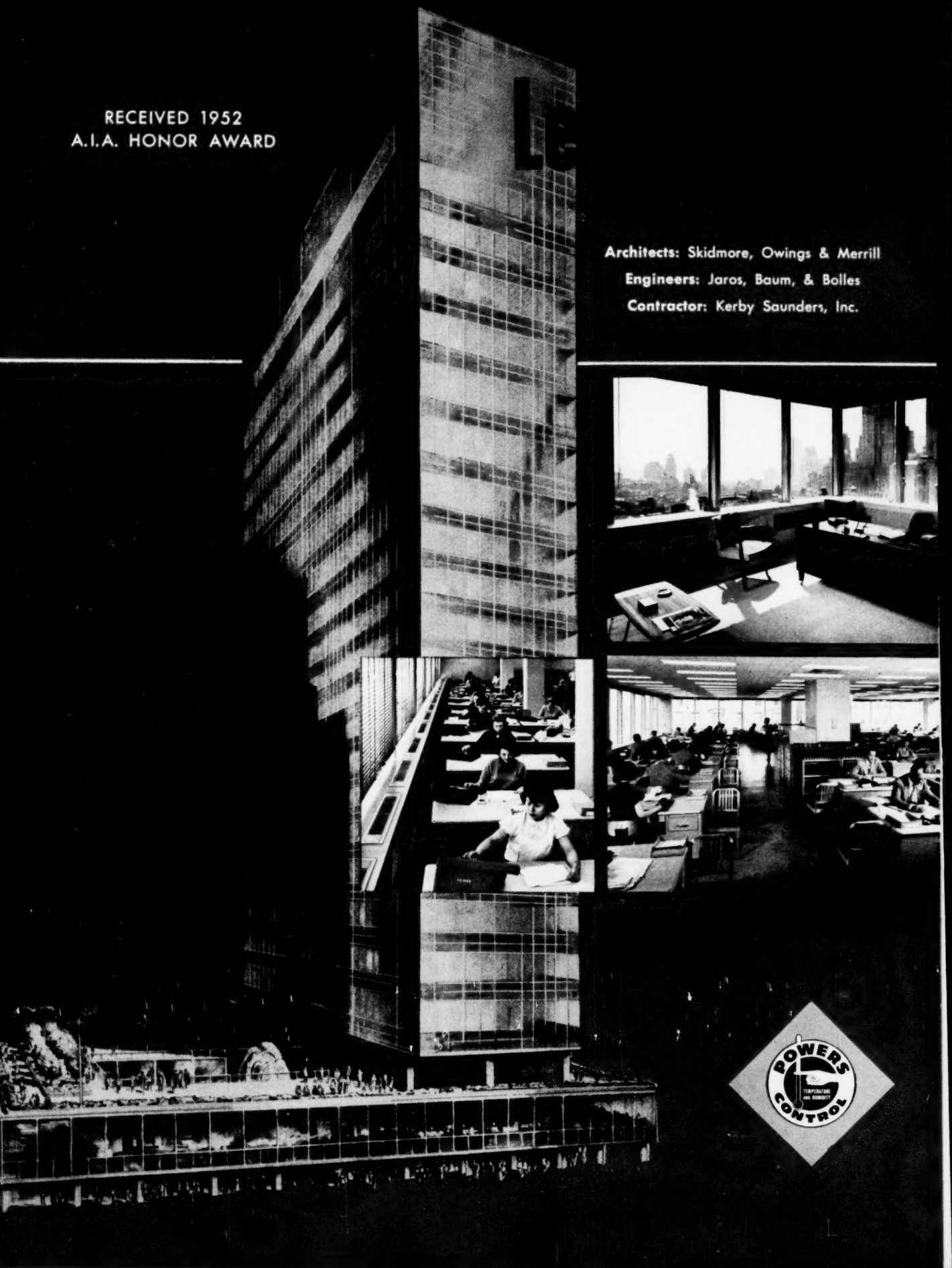
Name_____

Firm_____

Address_____

City_____ Zone____ State_____

RECEIVED 1952
A.I.A. HONOR AWARD



Architects: Skidmore, Owings & Merrill
Engineers: Jaros, Baum, & Bolles
Contractor: Kerby Saunders, Inc.

POWERS CONTROL

another New York landmark equipped with

POWERS Pneumatic System of AIR CONDITIONING CONTROL

Individual selection of desired temperature in each office and other spaces at Lever House provides year 'round comfort with important benefits of increased employee efficiency, less fatigue, absenteeism, illness, and lower cleaning costs.

Air conditioning here is by means of a split system — individual units shown below, for the glazed periphery of the building are fed with high pressure filtered and humidified air and heated or chilled water. In the center of the office space high velocity conditioned air is distributed thru ceiling diffusers.

Right-temperatured-air at proper humidity is assured at all times by a Powers pneumatic control system. Only a few of its important controls are shown below, most are "behind the scenes" performing their tasks with unfailing dependability.

Other Prominent POWERS Installations

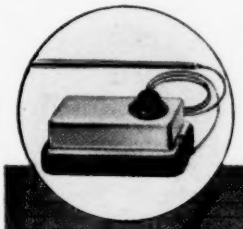
United States Capitol Building
UN General Assembly and Conference Buildings
New York Stock Exchange • Columbia Medical Center
Madison Square Garden • Radio City Music Hall
New York Times • Manhattan House • Esso Building
Harvard University • Massachusetts Inst. of Technology
Prudential Insurance Co. • Anheuser Busch Inc. Newark
Esso Research Center, Linden, N. J.
New York City Veterans Administration Hospital
Washington National Airport • LaGuardia Airport

Experience we have gained in many installations such as these may be helpful to you. When problems of temperature or humidity control arise contact POWERS nearest office, there's no obligation.

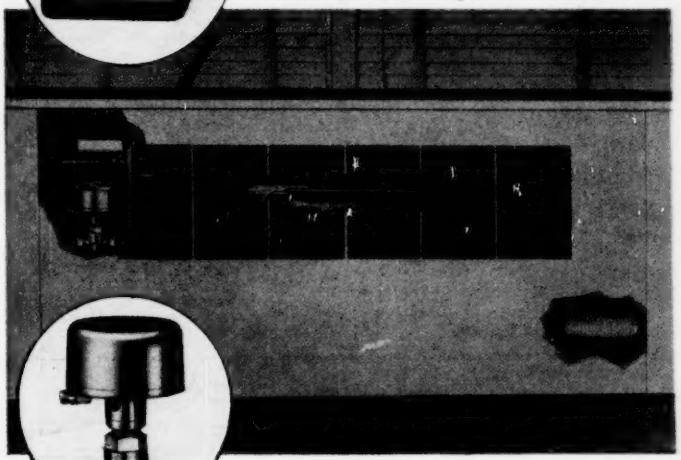
THE POWERS REGULATOR COMPANY

Over 60 Years of Automatic Temperature and Humidity Control

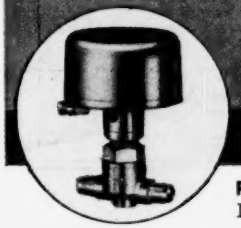
Skokie, Ill., Offices in Over 50 Cities, see your phone book



Powers Summer-Winter Thermostat and No-Pak Valve below, regulate air conditioning units in perimeter zones.



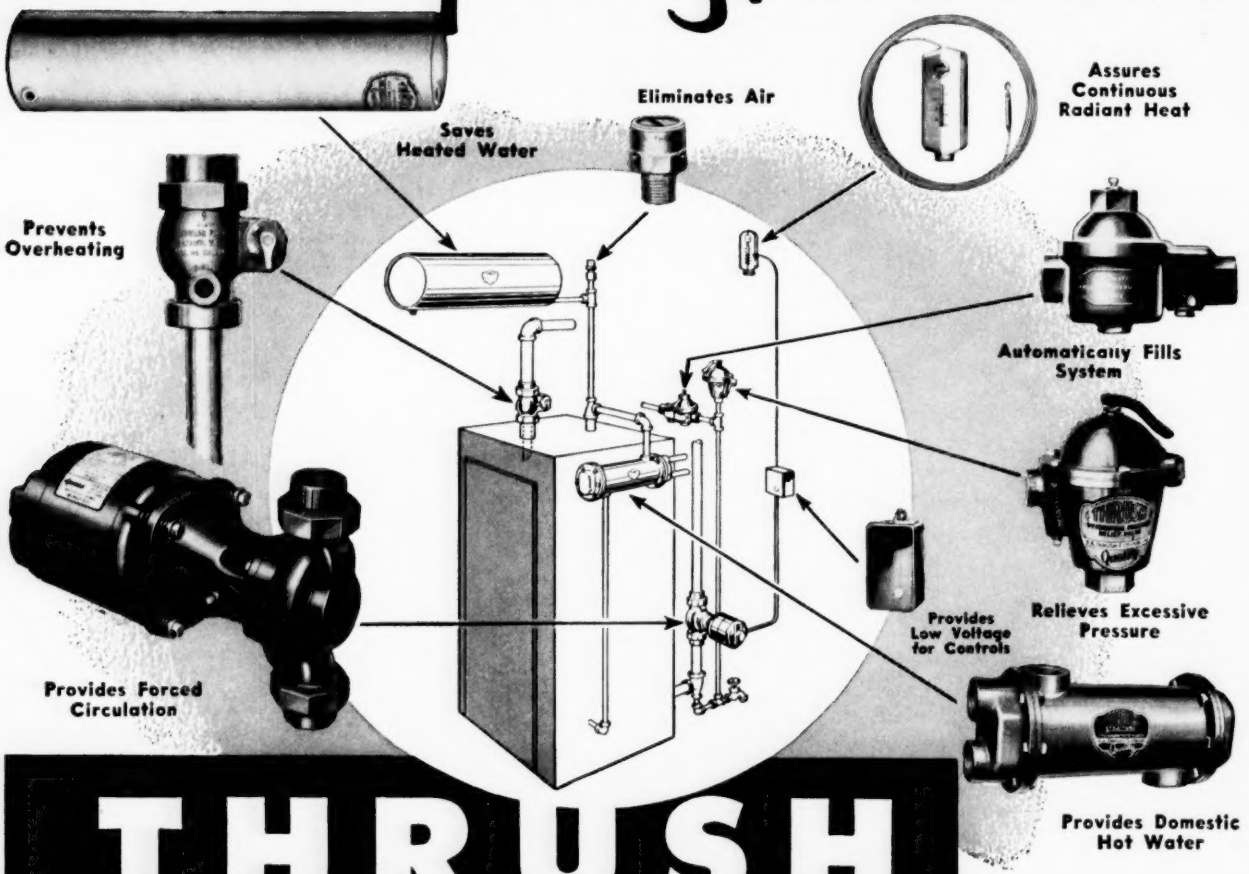
Powers Master Control Panel for primary air and water circuits plays an important part in the efficient regulation of the air conditioning system.



Powers NO-PAK Valve has unique Duo-Seal packless feature. It prevents water leakage – requires no packing maintenance.

(b4)

Sell Completely Automatic



THRUSH
flow control HOT WATER HEATING

SUCCESSFUL DEALERS, who install Thrush Flow Control Systems on all their hot water heating jobs, tell us that every Thrush installation sells another one. Enthusiastic home owners tell their friends . . . build good will . . . and that means more sales and profit for you.

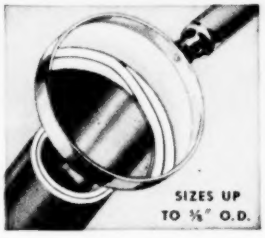
Thrush Flow Control System has everything to make sales easier and satisfy customers . . . unlimited choice of heating units (baseboards, radiant panels, convectors, etc.,) . . . fuel economy . . . small piping . . . comfort (less than 1° room temperature variation) . . . plenty of domestic water from the one boiler and years of trouble-free service. Sell the best heating equipment — SELL THRUSH. See your wholesaler for free Sales Helps and Free Engineering Service or write Dept. D-2 today!

H. A.
THRUSH
& COMPANY
PERU,
INDIANA

Assures a Continuous Flow of Radiant Heat

Lightweight, extra-strong coils of Bundyweld Tubing can be mounted easily onto ceilings by just two men. Coils lie flat and straight, are quickly plastered over with little chance of damage from rough handling or accidental hammer blows.

Want to pull ahead of competition? Do it with Bundyweld Ceiling Radiant Heating



Key to Low Cost

Bundyweld is the only tubing double-walled from a single strip, copper-brazed through 360° of wall contact. It's leakproof, thinner walled, yet stronger. It transmits heat quickly, has high bursting strength. It saves on material costs and installation time.

Standard 20′ lengths of Bundyweld are easily formed into coils in shop or on job site. Expanded ends (furnished when specified) are quickly soldered into leakproof union. Joined, lightweight coils are easily mounted onto ceiling, quickly plastered over.

Pull ahead of your competition and stay ahead—with Bundyweld Ceiling Radiant Heating. It's so comfortable, convenient and economical, it's making other heating methods obsolete.

It's today's big heating news—already drawing heavy interest and growing every day. Thousands of people now living with Bundyweld Ceiling Radiant Heating are spreading the good news to friends. Too, our full-page ads in *Better Homes & Gardens*, *House Beautiful*, and *American Home* are going to millions of readers. They, in turn, are bombarding us with coupons, requesting literature.

More important to you, they're asking for the names of plumbing and heating contractors who handle Bundyweld Ceiling Radiant Heating in their neighborhoods. Why not send coupon for free information today?

Radiant Heating Division
BUNDY TUBING COMPANY
Detroit 14, Michigan

SEND FOR FREE LITERATURE!

Bundyweld
Ceiling Radiant Heating

Radiant Heating Division, Dept. HV-253
Bundy Tubing Company, Detroit 14, Mich.

☐ Send free 20-page nontechnical brochure explaining Bundyweld Ceiling Radiant Heating.
☐ Send Bundy technical radiant heating pamphlet.

Name _____ Title _____
Company _____
Address _____
City _____ Zone ____ State _____

MEET BRYANT'S NEW "Command-Aire" TWINS

. . . now in mass production to make year 'round home conditioning a mass-market sales opportunity . . . for you!

Home builders and home buyers everywhere are enthusiastic about the new Bryant "Command-Aire" Twins. Here's why:

- They're being mass produced to bring the price of *complete* home comfort within the budget of *average* home buyers . . . *30 to 50% less than heretofore!*
- They're independent heating and cooling units matched in appearance and size. Builders can install the furnace first and offer the addition of air conditioning immediately, or later, according to the convenience of the buyer.
- They're being aggressively promoted on national and local levels—even right on the home site—to presell thousands who will buy homes this year.

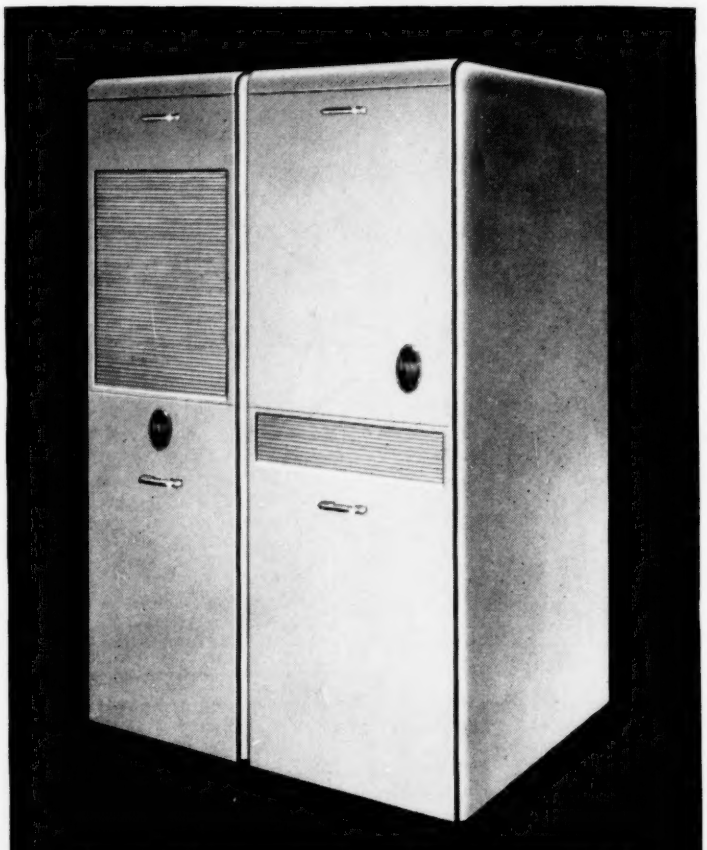
Here is a new, big-volume, high-profit sales opportunity for alert heating and air-conditioning dealers!

Homeowners want year 'round conditioning because it adds extra enjoyment . . . extra resale value.

Bryant's "Command-Aire" Twins now make it possible for them to have it at a price millions can afford.

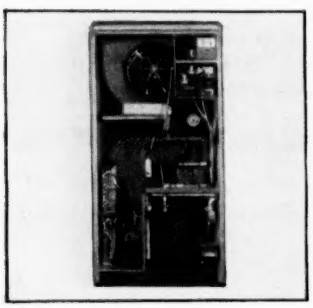
You can be one of the first to profit—by investigating this opportunity today!

Your nearby Bryant Distributor will be happy to provide complete details. Or write direct to Bryant Heater Division, 17825 St. Clair Ave., Cleveland, O.



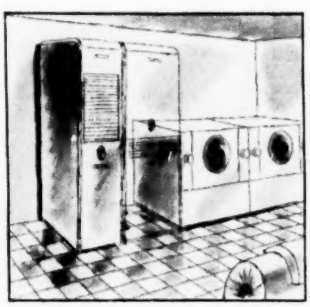
The "Command-Aire" Twins consist of a new Bryant Forced Warm-Air Furnace (*gas* or *oil*) combined with a new self-contained Bryant 2, 3 or 5-ton Air Conditioner. Many combinations of heating and cooling capacities are available.

bryant® *means business... better business for dealers*

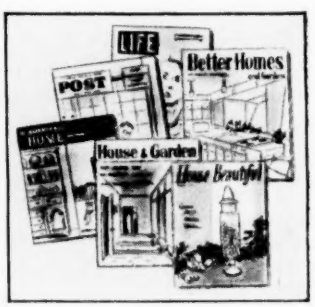


Air Conditioner is independent unit with its own blower, filter and controls . . . eliminates need for air to pass through both units . . . improves both heating and cooling efficiency.

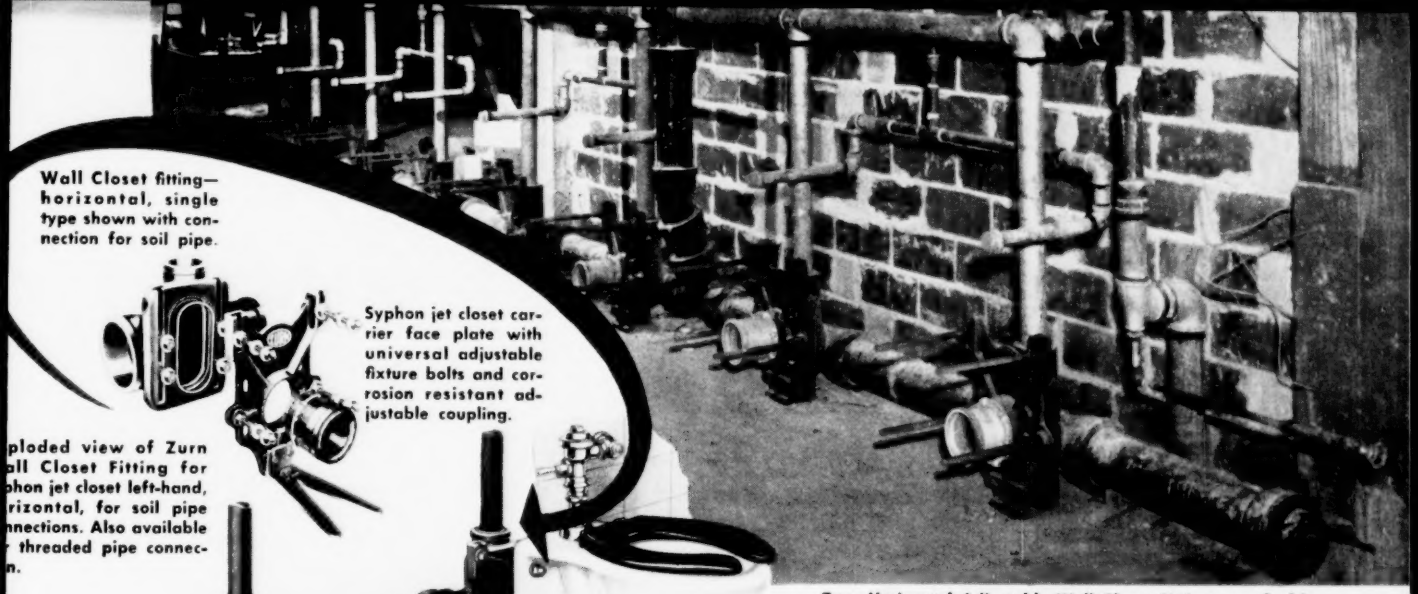
Five-year warranty on the hermetically sealed cooling compressors of the 2 and 3-ton "Command-Aire" cooling units . . . has tremendous appeal to prospective buyers.



One cooling unit sells hundreds! Builder can install "Twins" in his model home and leave space for the cooling unit in the others—where your prospects will live.



Powerful promotion presells "Twins"! Extensive national advertising and local publicity and promotion will presell the "Twins" to hundreds in your area.



Wall Closet fitting—horizontal, single type shown with connection for soil pipe.

Syphon jet closet carrier face plate with universal adjustable fixture bolts and corrosion resistant adjustable coupling.

ploded view of Zurn all Closet Fitting for phon jet closet left-hand, rizontal, for soil pipe nnections. Also available threaded pipe connec-n.

Pat. and Pat. Pend.

Zurn Horizontal Adjustable Wall Closet Fittings roughed-in in a large Chemical Plant.

ZURN

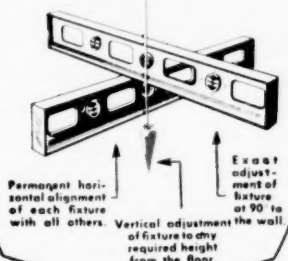
ENGINEERED CARRIER SYSTEMS

usually reduce the over-all cost of fixture installations

THE ZURN WAY

PERFECT ALIGNMENT IN ALL 3 DIRECTIONS

Obtained with Exclusive Adjustment Features of Zurn Wall Closet Fittings And Carriers...For The Support of All Types And Makes of Wall Type Fixtures


Permanent horizontal alignment of each fixture with all others.
Vertical adjustment of fixture to any required height from the floor.
Exact adjustment of fixture at 90° to the wall.

The Zurn Way of installing wall-type fixtures practically eliminates the hazards commonly experienced and offers these plus features and advantages: Flexibility of Zurn Engineered Carrier Systems assures speed in assembly and accurate alignment in all three directions during installation; rigid watertight connections insure minimum final adjustments when installing wall-type toilets; bulk of assembly can be precut in shop; unique waterway allowing a 4" vertical adjustment does away with numbered fittings. Zurn Engineered Carrier Systems for any make of wall-type fixtures can be assembled into an almost limitless variety of installations. Installations of wall-type toilets have the horizontal drainage line, up to where it connects to the stack, installed above the floor, behind the toilets, behind the wall—no furring in or delays waiting for other crafts.

Zurn Engineered Carrier Systems are available for installing any type or make of wall-type toilet, urinal, lavatory, sink, and other wall-type fixtures. Write for free booklet entitled, "You Can Build It and Maintain It For Less A NEW WAY".

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J. A. ZURN MFG. CO. PLUMBING DIVISION—ERIE, PA., U. S. A.

Sales Offices in All Principal Cities
Pre-eminent Manufacturer of Sanitary Products for the Protection of Human Health and Modern Structures
In Canada: Canadian Zurn Engineering Ltd., Montreal, P. Q.

ZURN **PLUMBING DIVISION PRODUCTS INCLUDE EVERYTHING FOR DRAINAGE SYSTEMS FROM ROOF TO BASEMENT.**

One of several types of Zurn Engineered Carriers for wall-type urinals.

Greaseptor.

Area Floor Drain.

Backwater Valve Non-fouling.

Roof Drain with Internal Expansion Joint; High Velocity Drainage.

Supremo Perfect Seal Floor Level Cleanout.

Over 500,000 Wall-Type Fixtures Now Installed With **ZURN ENGINEERED CARRIER SYSTEMS** In Buildings Of Every Type From Coast to Coast. Write for list of buildings having rest rooms with fixture-bare floors.

J. A. ZURN MFG. CO.
PLUMBING DIVISION
ERIE, PA., U. S. A.

Please send me the new Zurn booklet, "You Can Build It and Maintain It For Less A NEW WAY".

Name and Title .....

Company .....

Street .....

City and State .....

Please attach coupon to your business letterhead.
Dept. H.V.

BRIEFLY STATED

• William E. Judd, general sales manager of the South Wind heating equipment division, Indianapolis, since 1949, has been appointed assistant to James S. Knowlson, president and board chairman of Stewart-Warner Corp., Chicago, Ill. Mr. Judd, who started in the heater service department in 1942, was chief engineer on the west coast during the war, later becoming chief field engineer and then assistant general sales manager.

• William B. Cott has been named manager of air conditioning application engineering for Sturtevant Div., Westinghouse Electric Corp., Hyde Park, Mass. He fills a post left vacant by the death of Tolbert Earl Smith. Mr. Cott joined the firm in 1941, having previously been employed by the Carmichael Construction Co., Akron, Ohio, and the Doerman Rocher Company, Cincinnati, on air conditioning engineering and sales.

• Samuel Garre, Jr., has been appointed director of sales for Ehret Magnesia Mfg. Co., Valley Forge, Pa. Mr. Garre was formerly sales manager for Insulation Div., Mundet Cork Corp., and was with that company for 21 years. Mr. Garre will direct the company's relations with contractors and sales activities.

• Edward H. Seelert was seized with a heart attack January 1st, and died instantly. In 1920 he joined Witte Mfg. Co., Minneapolis, as plant superintendent, and in 1926 when this company was re-organized as the McQuay Radiator Corporation, he remained with the new company as plant manager. In 1932 he was one of the original founders of McQuay, Inc., Minneapolis, and has been associated with it ever since. At his death he was a director of the company, and also vice-president and secretary-treasurer. He is survived by his widow, daughter, two brothers and two sisters.

• Charles H. Currier, 66, chairman of the board of Kewanee-Ross Corporation, died on December 22 in Buffalo, N. Y. Mr. Currier became chairman when Ross Heater & Mfg. Co., Inc., of which he was president, was joined with the former. He became associated with the latter firm in 1934 as vice-president. He had previously been president of Drying Systems, Inc., since 1927, and vice-president since 1916. Surviving him are a brother and a sister.

• Establishment of a specialty refrigeration products department has been announced by the General Electric Co., Louisville, Ky. Harold B. Donley, who headed the room cooler department, will be general manager of the new department. Three executive appointments in the new department were also announced. J. Harold Erickson, formerly manager of finance for the room cooler department, will hold the same position in the new department. James F. Young, formerly division engineer for food freezers at the Erie, Pa., works, was named manager of engineering. Roy Johnson, former superintendent of food freezer manufacturing, was appointed manager of manufacturing.

• Fundamentals of Operating Engineering is a series of nine week, one evening a week, courses offered to Chicago residents in the non-credit programs at Wright Junior College, and Wilson Junior College. The complete course has been divided into eight semester units to be covered two at a time. Units to be taught in spring 1953 are heating, ventilation, and air conditioning, and elements of electricity. Classes meet February 24 to April 24.

• Everett N. McDonnell, president of McDonnell & Miller, Inc., Chicago, Ill., has been selected to receive the 1952 F. Paul Anderson Medal of ASHVE, being cited for outstanding work in the field of heating, ventilating and air conditioning. Formal presentation of the award was made at the society's 59th annual meeting in Chicago. A leader in the design and manufacture of safety devices for steam and hot water heating boilers and liquid level controls, and active in many groups concerned with facilities for heating and ventilating, Mr. McDonnell has been an influence in the development and expansion of the field. His selection for the medal is in recognition of his scientific achievements and for outstanding services in his field of engineering. In 1919, he joined the McAlear Manufacturing Company. He had become secretary and director when he resigned in 1924 to form McDonnell & Miller, Inc. In June, 1929, he acquired his partner's interest, and has since been president of the company.

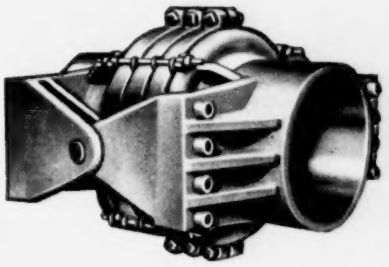
• Bastian-Morley Co., Inc., La Porte, Indiana, announced the election of H. J. Rose as president, succeeding J. P. Morley, who becomes chairman of the board of directors. N. R. Feltes, who was vice-president, is now vice-chairman of the board. Three new vice-presidents have been elected: H. B. Carbon in charge of sales; J. E. Williams in charge of manufacturing, and H. J. Morley in charge of advertising and sales promotion. Treasurer is H. J. Kohne, and secretary is R. A. Hunter.

• Vapor Heating Corp., Chicago, Ill., announces the appointment of William C. Keeran, as executive engineer. He will supervise all phases of engineering, research, and design of the company's products. Mr. Keeran will also continue as vice-president in charge of Roth Mfg. Co., Chicago, a manufacturing subsidiary. Mr. Keeran has been with the firm eleven years with a background of engineering and production with other companies.

• C. A. Dunham Co., Chicago, Ill., announced the selection of a new advertising manager, Jack W. O'Neil. Mr. O'Neil was employed for the past two years as assistant to the advertising manager of Skil Corp., Chicago.

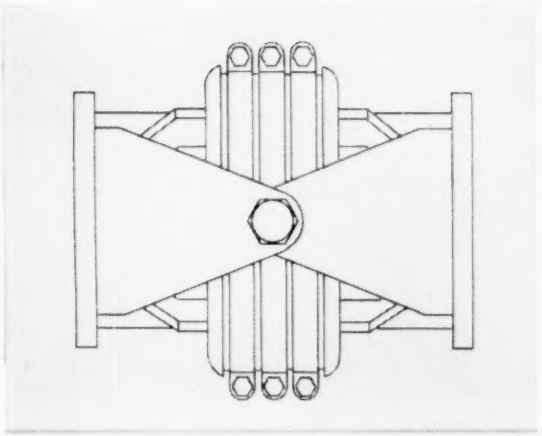
• Leo C. McRoberts has been promoted from account executive by Minneapolis-Honeywell Regulator Company to market supervisor in the appliance controls division. Mr. McRoberts will direct sales of automatic control equipment made in the firm's Los Angeles plant. He joined the company in 1946 in the Kansas City sales office, and in 1950 was assigned to the Dallas sales office as sales manager of the wholesale division's southwest region. He became account executive in the Minneapolis office in October, 1951.

PIPE EXPANSION...?



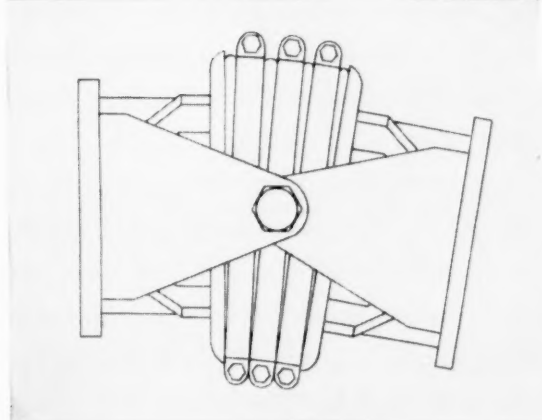
Corruflex Packless Hinge Joint

ADSCO HAS THE JOINT

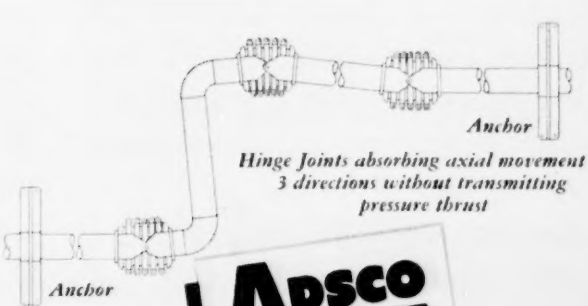


Hinge Joint in straight position

Hinge Joint in angular position as a result of pipe line expansion



● Because ADSCO makes the world's most complete line of slip and packless expansion joints, it has exactly the right joint to fill each need...The Corruflex Hinge Joint illustrates just one type of ADSCO's packless expansion joints. This joint permits movement in one plane by rotating about its own hinge-pin axis. In the application shown below, Hinge Joints are used to permit the pipe line to expand in three directions without transmitting line pressure thrust to anchors and without causing excessive stresses in the piping. This is a distinct advantage in elevated pipe lines or in cases where there is no structure strong enough to provide for end-anchor thrust... But the Corruflex Packless Hinge Joint is only one joint in ADSCO's complete line of slip and packless expansion joints. Whatever the problem, call an ADSCO representative first...or write for Bulletin 35-51A.



Hinge Joints absorbing axial movement in 3 directions without transmitting pressure thrust

ADSCO ENGINEERED PRODUCTS

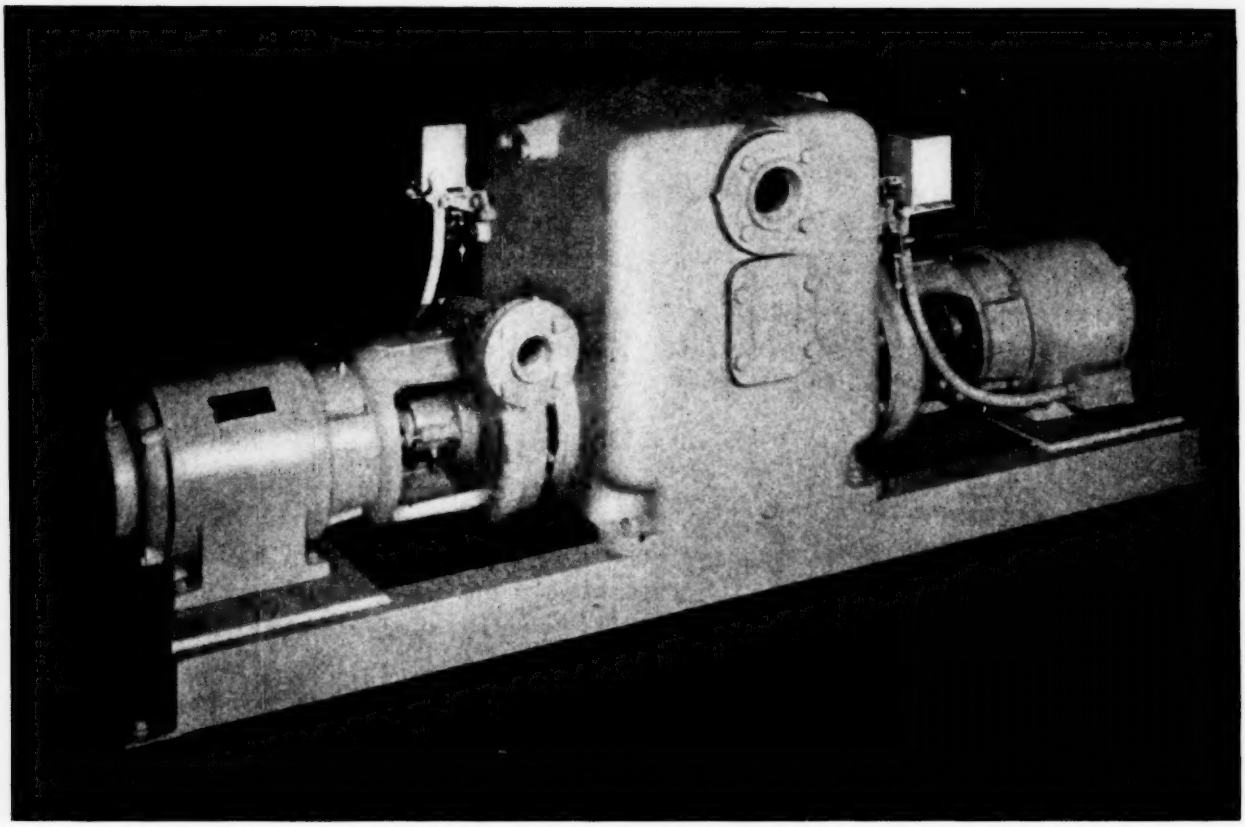
EXPANSION JOINTS
HEAT EXCHANGERS
STEAM TRAPS
STRAINERS
SEPARATORS
METERS

AMERICAN DISTRICT STEAM COMPANY, INC.

NORTH TONAWANDA, NEW YORK

Since 1877

MAXIMUM EFFICIENCY FOR STEAM HEATING SYSTEMS ON HEATING, DRYING AND PROCESS WORK.



JENNINGS CONDENSATION PUMPS

Designed for steam systems on heating, drying, or process work, these pumps offer the most reliable and efficient means of returning hot condensate to boiler or hot well. In many cases these pumps will save costly installation of boilers in a pit to provide gravity flow of returns from basement radiators and heating devices.

The Jennings Condensation Pumps are sturdy and compact in construction, and combine receiving tank, pump and driving motor in a single assembly. Pumps are bronze fitted throughout, with tobin bronze shaft. The pumping impeller is of special design, made possible by our wide experience with return line heating pumps, and is especially adapted for handling hot water with the greatest possible efficiency.

Full automatic control is furnished by means of a ball float and float switch mechanism mounted on the receiving tank. All wiring is made up at the factory, and it is necessary only to connect the pump to the system and hook up the leads. Complete information regarding these economical pumps sent promptly on request.

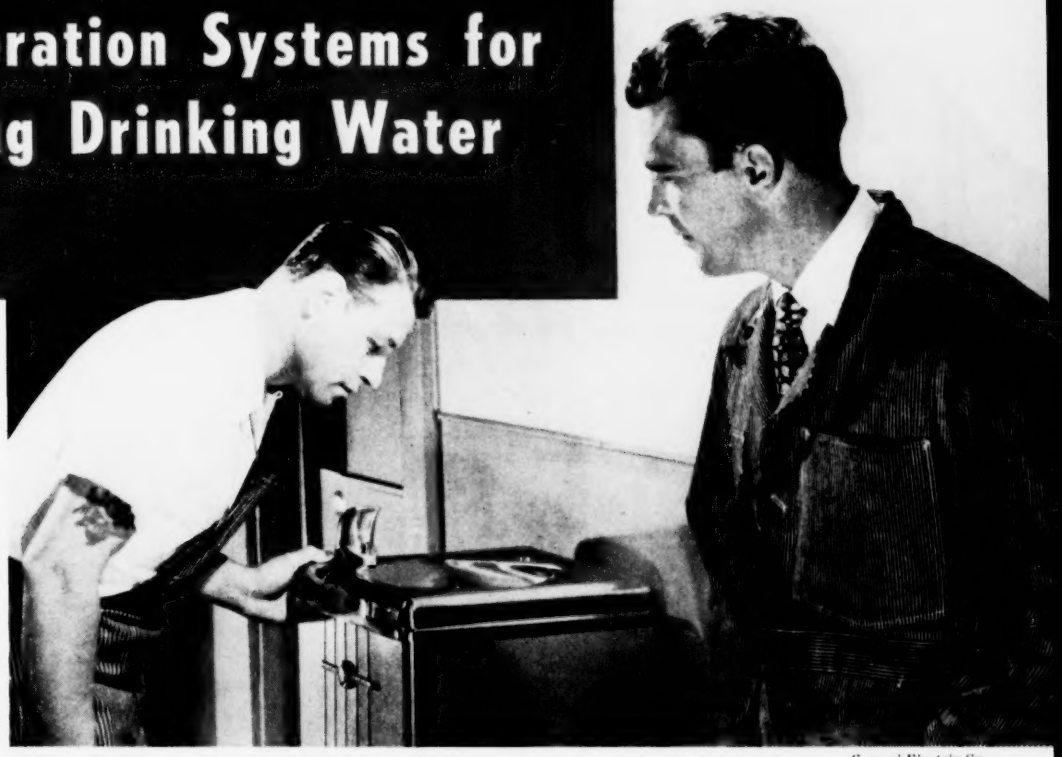
THE NASH ENGINEERING COMPANY

SOUTH NORWALK, CONNECTICUT, U. S. A.

Refrigeration Systems for Cooling Drinking Water

JOSEPH ASKIN

Engineer, Tele King Corp., New York, N. Y.



General Electric Co.

A discussion of the various refrigeration systems available for cooling drinking water—from the self-contained bubbler cooler to the central system that serves multi-story buildings.

To maintain a state of health, each person requires from one half to 2½ gallons of water daily, depending upon the activity in which that individual is engaged. Even for one in the most inactive state, the amount of water consumed by a person is astounding and perhaps unbelievable.

It is obvious that water which is tepid is not as thirst quenching as water which has been cooled to a temperature of from 40 to 50F. The 40F water appeals to people who are intermittently at rest, whereas those who are engaged in extreme physical activity prefer water at 50F. To the latter, the water tastes just as cool at 50F as 40F water does to the former. Although some beverages, like the Colas for example, are more palatable at temperatures below 40F, the 40 to 50 range seems to be the accepted temperature for drinking water.

Generally speaking, city tap water temperatures are higher than 50F as shown in Table 1, which lists tap water temperatures of some of our larger cities. If the water source is from surface streams, this temperature is considerably higher than 50F. Even water from a deep well warms in the pipe distribution system and is also higher than 50F. Therefore, it has been found desirable to cool the water in offices, factories, restaurants, schools and theaters. In offices and factories it has been determined that drinking water which has been cooled, actually improves the efficiency of the worker; in restaurants, it increases the enjoyment of the meal: in schools, it improves the alertness of the pupils; and in theaters it enhances the pleasure of the show.

Table 2 shows the approximate amount of water consumed per hour by an average person under average conditions of room temperature. In the case of service where a bubbler spout is used, some of the water goes down the drain. By the use of a heat exchanger some of the cooling effect of this drain water is salvaged.

Heat removal from the water is generally done by refrigeration, and the total amount of heat removed can be calculated from the information given in Tables 1 and 2. The calculation is simplified by the fact that both the specific heat and specific gravity of water is 1.0.

Various methods of cooling drinking water have been

TABLE 1—SUMMER TAP WATER TEMPERATURES

City	Temp., F	City	Temp., F
Albany, N. Y.	66	Muncie, Ind.	76
Baltimore, Md.	70	Newark, N. J.	72
Boston, Mass.	74	New York, N. Y.	70
Camden, N. J.	58	Oakland, Calif.	64
Chicago, Ill.	69	Pasadena, Calif.	74
Cleveland, Ohio	74	Portland, Ore.	62
Detroit, Mich.	75	Rochester, N. Y.	68
Duluth, Minn.	71	Sacramento, Calif.	81
Erie, Pa.	73	St. Louis, Mo.	85
Fort Wayne, Ind.	79	Salt Lake City, Utah	58
Gary, Ind.	70	Seattle, Wash.	62
Hartford, Conn.	70	Syracuse, N. Y.	65
Indianapolis, Ind.	82	Toledo, Ohio	84
Jackson, Miss.	82	Trenton, N. J.	79
Jackson, Mich.	52	Utica, N. Y.	70
Kansas City, Kans.	93	Washington, D. C.	75
Lansing, Mich.	59	Youngstown, Ohio	69
Los Angeles, Calif.	76		

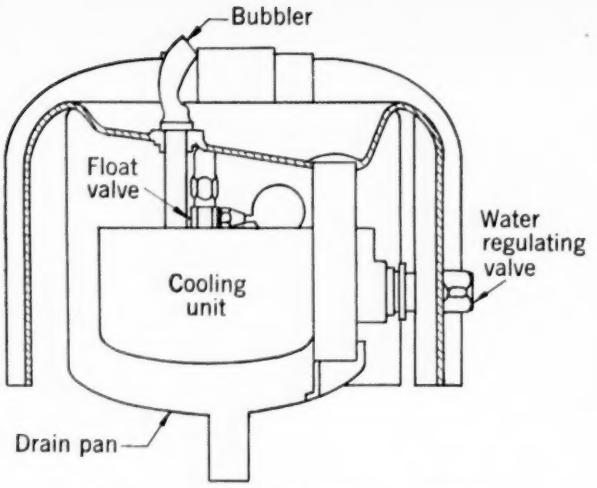


Fig. 1. Parts of a Temprite wall fountain.

devised. The individual 5 gal bottle cooler which dispenses cool water in 4-ounce cups is one of the oldest methods. The unit is a complete self-contained refrigeration machine, controlling its own water temperature. Generally these units contain air-cooled condensers. In locations where dust is likely to plug up the air passages, this type of unit has given way to a water cooled unit or to a central cooling plant.

A self-contained bubbler cooler may be installed in locations where tap water is satisfactory from the standpoint of flavor or bacteria count, or where a 5 gal bottle of spring water is too costly. Not only is the cost of the spring water a factor, but also the cost of the cups, in considering preference for a bubbler cooler over that of a bottle cooler.

The individual small cooler has distinct advantages, particularly from the standpoint of reliability. For example, if one cooler out of an installation of ten should go out of order, nine coolers would still be in perfect operation. The U. S. Navy, for their ships, has considered this factor as one of the most important in the selection of individual coolers. The use of central cooling plants on the Navy vessels was ruled out on account of the hazard of the entire plant going out of service at an inopportune time.

Central plants, however, have certain advantages. Among the most important is the fact that no floor space is required. Another is that the system may be considerably more economical than a large number of individual water coolers.

With the cost of refrigeration equipment and the cost of electric energy on the increase, the trend, naturally, is to seek more economical means for cooling drinking water. Some of the newer methods will be discussed.

Individual Units

The Temprite units, Fig. 1, may be mounted in various locations on the same floor or on different floors. Each individual unit consists of a low side float flooded evaporator, and the coil through which flows the water to be cooled, is located within the evaporator and is surrounded by liquid refrigerant. This arrangement of liquid refrigerant on one side and water on the other side gives a high rate of heat transfer. In order that the water may not freeze, a constant pressure valve is connected to the outlet of each unit, the purpose of which is to control the suction pressure within the unit and thus avoid a freeze-up. An unlimited number of these units may be multiplexed to one compressor. Drawing water from one fixture, either from a bubbler spout or from a goose-neck filler, will raise the suction pressure, start the compressor, and pull down the temperature without affecting the temperature of the water within the other fixtures.

This type of system is very economical in water consumption as the cold water is located directly at the point of usage. There is no refrigeration loss in the water leading to each fixture, and no insulation of the water line is necessary.

TABLE 2—WATER CONSUMPTION PER PERSON

Location	Type of Service	Water Used per Person per Hour
Office	Cup	One 4-ounce cup
Office	Bubbler	8 ounces
Factory	Bubbler	22 ounces
Factory, hot operations	Bubbler	32 ounces
Restaurant	Glass	1½ 8-ounce glasses
Theater	Bubbler	One 4-ounce cup
School	Bubbler	11 ounces
Hotel	Bubbler	8 ounces

Use of Secondary Refrigerant

A method developed by Frigidaire employs the use of a secondary refrigerant. A cylinder shown in Fig. 2 is partially filled with liquid refrigerant and sealed tight. The water coil is located in the lower part of this cylinder. The dry expansion evaporator, located in the upper part of the same cylinder, is controlled by means of a thermal expansion valve and a temperature regulating valve which keeps the water from freezing.

The operation of this unit is as follows: Warm water entering the water coil vaporizes the secondary refrigerant which rises upward. Here it comes in contact with the dry expansion evaporator coil where the secondary refrigerant is cooled, condenses and then drops to the bottom of the sealed cylinder, covering the water coils. The primary refrigerant, having been vaporized, is drawn off to the suction side of the compressor, and then passes through the conventional refrigeration cycle.

In the smaller sizes these coolers may be multiplexed to one compressor, and placed at various locations similar to the Temprite unit previously described. Or one large unit may be connected to an insulated water tank from

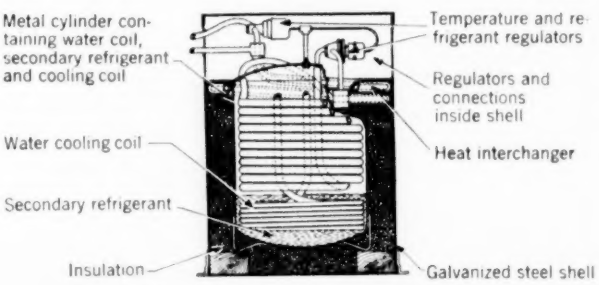


Fig. 2. System employing a secondary refrigerant.

which the water may be distributed to a large number of bubbler spout fixtures either by means of an open type system shown in Fig. 3 or a closed type circulating system shown in Fig. 4. Both will be described later in more detail.

This Frigidaire type of cooler has proven to be foolproof and has given outstanding results for a number of years.

Where sanitary codes do not allow the drinking fluid to be separated from the refrigerant by only one wall of metal such as in the systems just described, the "sandwich" coil, patented by Askin and illustrated in Fig. 5 may be used. York used this type of evaporator. It consists of alternate layers of water tubing and refrigerant tubing, which tubes are in intimate contact with one another. The tubes are flattened so that a good thermal bond exists between adjacent layers. This closeness of contact aids in improving heat transfer. The refrigerant coil is connected at its inlet to a thermal expansion valve, and at its outlet to a constant pressure valve, designed to maintain a constant pressure in order to keep the water from freezing. These coils form a small package which can be placed within some types of wall fountains. A number of these "sandwich" coils may be multiplexed to one compressor placed at a remote point.

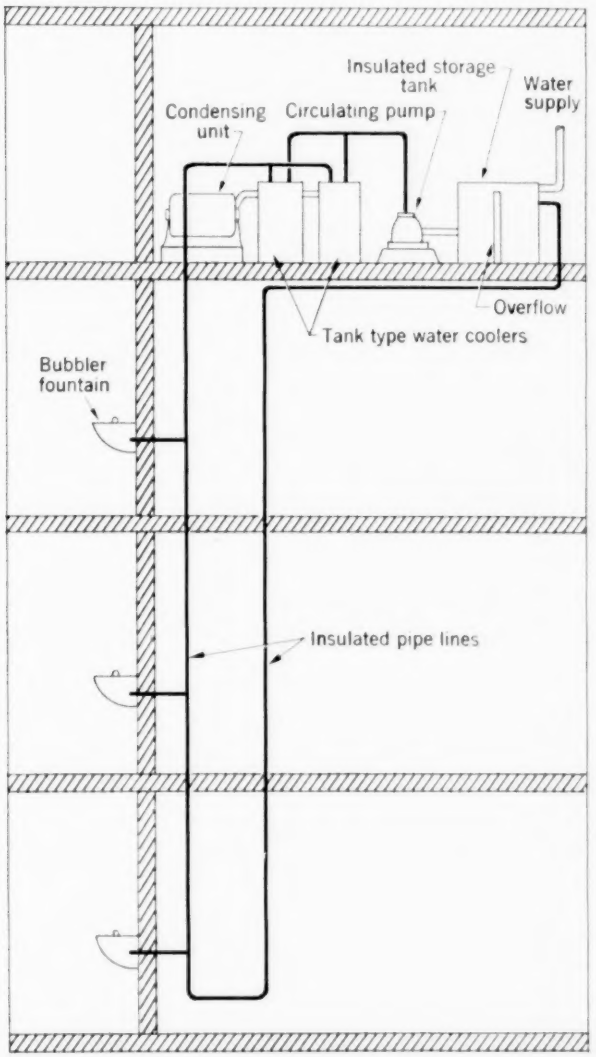


Fig. 3. Open type circulating system serves many floors.

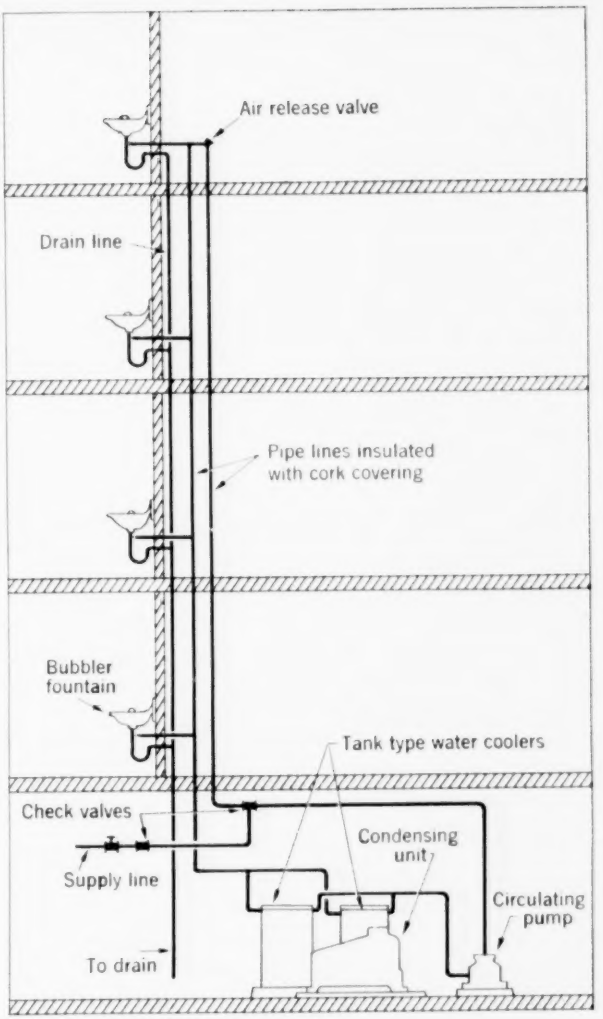


Fig. 4. This circuit provides cool water almost at once.

Open Type Circulating System

In restaurants and hotels and other establishments where a heavy intermittent demand for cool drinking water occurs, an open type circulating system may be arranged. Such a system, Fig. 3, has several distinct advantages:

(1) The condensing unit is unusually small, as the stored cold water is sufficient to take care of intermittent peak demands.

(2) There is very little or no danger of a freeze up.

(3) An arrangement can be made for the water to flow by gravity, thus eliminating the pump and the possible service problems connected with the use of a pump.

Peak loads are easily taken care of by the ice stored around the refrigerant coil as shown in Fig. 6. The refrigerant temperature controls the formation of the amount of ice accumulating around the refrigerant coil. The water coil can be placed on the opposite side in an open tank in which the water level is controlled by a float, or it can be placed in the center, surrounded by the ice-coated refrigerant coil. As the water is drawn off from

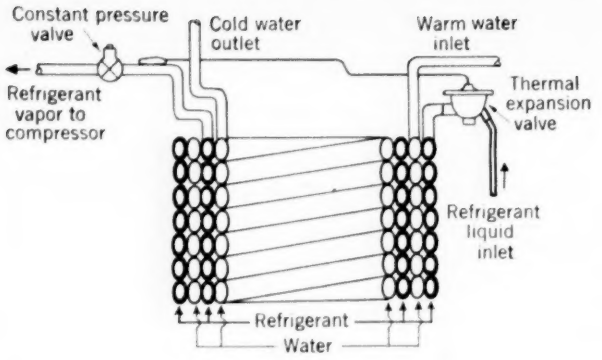


Fig. 5. Askin sandwich type of coil.

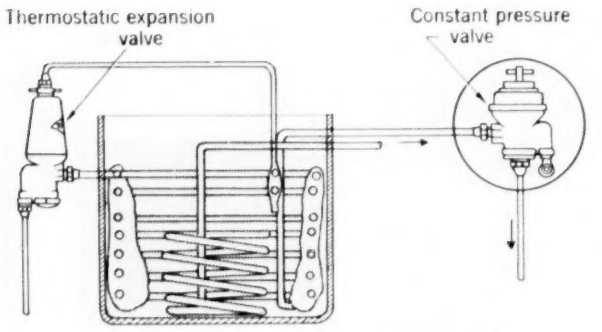


Fig. 6. Ice is stored around refrigerant coil.

any of the fountains, fresh water enters the tank, and by spilling this fresh, incoming water over the ice cake, some of the ice is melted off. The amount of water entering is equal to the amount drawn off.

Means to Improve Circulation

The late W. H. Parker of Hasco, Inc., suggested what he called an "enjector" nozzle in order to create extra circulation in the vertical supply line without the use of a pump. His layout, showing the application of the nozzle in a closed system is shown in Fig. 7, and the nozzle is shown in Fig. 8. It is not necessary to install a circulating pump, as shown in the closed system of Fig. 4, to circulate the water, if the bubblers are installed above each other and the piping runs vertically. When water is drawn from one of the outlets, the inlet tap water passes through the "enjector" nozzle, creating suction on the cold water inlet side of the system, thus pulling a good deal more cold water out of the storage tank than is being consumed, and circulating it throughout the system. This results in a good deal less waste, as the water in the line leading to each outlet is kept in a cold state most of the time, and the consumer need not wait long before cold water flows from the spout or faucet. Just as soon as the faucet is opened, cold water flows. No draw-off of warm water is required.

Should it be necessary to locate the storage tank in the basement near the condensing unit, the open tank with ice storage arrangement can still be used in conjunction with a shallow well type of pump; and the outlet piped to various fountains throughout the building. These piston type pumps, used in thousands of farm houses today, have automatic cut outs and air relief devices, and they are very reliable. Connected to a relatively small condensing unit, this storage type of evaporator makes a satisfactory and economical water cooling system. The storage tank with a built-up cake of ice takes care of extremely high peak loads.

Either a thermal or automatic expansion valve can be used on the inlet to the refrigerant evaporator, and a thermostat control used for maintaining the proper temperature of the water.

Closed Type Circulating System

The circulating system, closed type, was shown in Fig. 4. In such a system, the circulating pump, generally of a centrifugal type, keeps the lines filled with cold water, so that when an outlet is opened, the water is cold almost immediately. It is not necessary to run the water for several minutes to bleed off the warm water. The evaporator of such a system may be one of several types. In Fig. 9, the warm water is pumped through a coil located in the lower portion of a brine tank, and the outlet from this coil is connected to the vertical riser leading to each fountain. In the upper portion of the brine tank a refrigerant evaporator coil is placed. The brine is kept in a cool state by the refrigeration system. Although this water cooler is classified as an instantaneous cooler, still the brine does have a small amount of hold-over capacity. However, in such an installation, the compressor necessarily must be of greater capacity than that used in the ice storage system described previously.

The circulating system differs from the other water cooling system in that the water is cooled in one water cooler and is then circulated by a pump to the various bubblers. It was one of the first methods in use for distributing cool drinking water and is still used in buildings such as hospitals where an absolutely quiet system is desired, and in other buildings where refrigerant lines

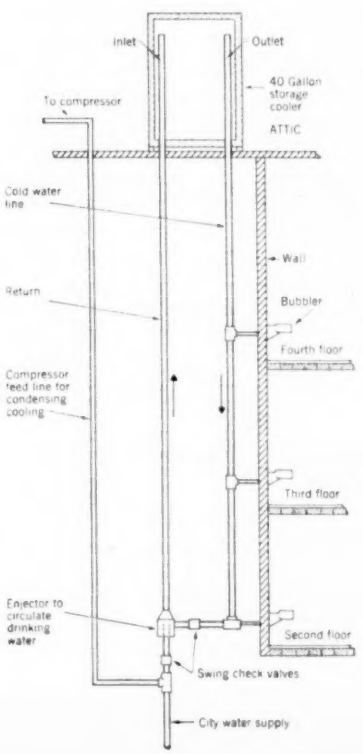


Fig. 7. Parker circuit to create extra circulation.

cannot be run through the buildings because of local codes.

The circulating system consists of a condensing unit, a water cooler of one type or another, a circulating pump, a number of water bubblers together with the necessary insulated piping for distributing the chilled water to the bubblers and for returning the circulated water back to the water cooler. Some provision for venting the air from the system also has to be made, and the vent is usually installed at the highest point in the system.

Both types of circulating systems are in use today, the open system, Fig. 3, and the closed system, Fig. 4. Both systems are similar, and differ only in that the closed system is under pressure at all times while the open system is open to the atmosphere. In the closed system, the make-up water is fed into the suction side of the pump, while in the open system the make-up water is fed into an open tank cooler under the control of a float valve.

In the open system a circulating pump may or may not be used. If a pump is used, the water flows from the open tank cooler to the circulating pump, which forces it through the distribution system. This pump must deliver the water with sufficient pressure to lift the water to the top of the system, and to force the water through the highest outlet and overcome pipe friction losses.

Frequently the tank cooler is placed at the highest point of the system, in which case a pump need not be used. A float is used in the open storage tank and the water flows downward by gravity to the various outlets on the floors below.

Another type of cooling unit used in a closed system is shown in Fig. 10. In this cooler the warm water enters a storage tank which is surrounded by a refrigerant coil. The tank containing the stored drinking water and the refrigerant coil surrounding the tank are located in a large insulated container which is filled with sweet water (water which contains no salt). From the lower part of the tank containing the stored water, a line leads to an additional coil located in the water bath. The water bath and the drinking water storage tank do furnish a large amount of hold-over which can carry the cooling load during peak periods of heavy demand. Thus the size of the refrigeration machine can be reduced appreciably as this type of cooling unit makes a storage type of unit out of the system rather than that of an instantaneous type.

The lack of flushing action through a water storage tank may result in slime and bacteria deposits. Care must be taken to avoid dead water pockets by keeping the tank

Fig. 8. Details of the "enjector" nozzle.

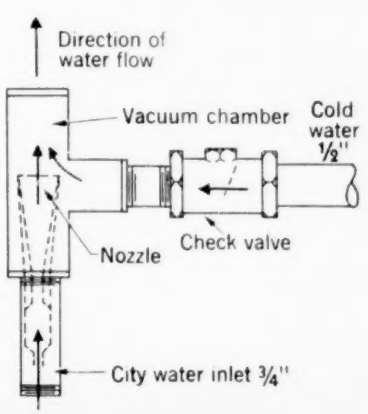
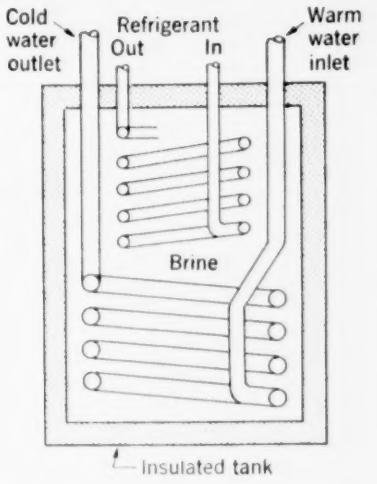


Fig. 9. System employing two coils in a brine tank.



diameter small and by having the outlet directly at the bottom of the tank as shown in this illustration.

Use of Ground Water

The temperature of surface water when used as a source of drinking water is generally so high that cooling of the

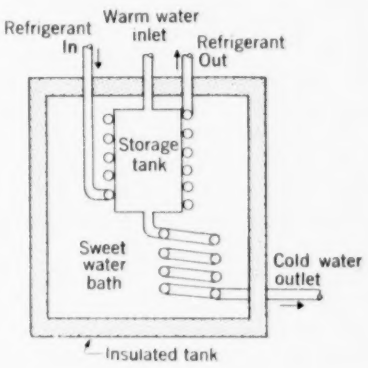


Fig. 10. Water to be cooled enters a storage tank surrounded by a refrigerant coil.

water is necessary. Ground water temperatures, however, may be sufficiently low to satisfy drinking water demands, depending upon the geographical location of the well.

In rural sections this ground water is being used directly for drinking purposes. But in urban sections, where most of the water coolers are installed, this water cannot be used for several reasons:

(1) The bacteria count of deep well water is too great due to pollution from sewers and ground dust, if the well is located in a congested area.

(2) City codes in many locations restrict the removal of ground water for fear of lowering the water table of that section.

(3) Ground water may have salts dissolved in it which impart an undesirable taste or odor to the water.

In case these restrictions interfere with the use of cool well water directly for drinking purposes, another method has been resorted to.

Combined System

In seeking more economical ways of producing cool, refreshing drinking water, well water may be used to pre-

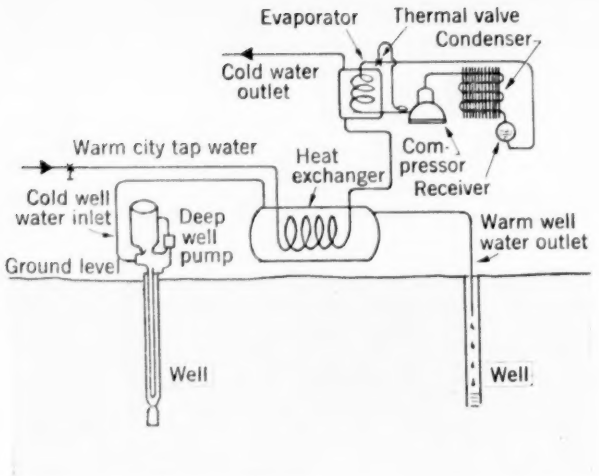


Fig. 11. Two wells are used with this water cooling system.

cool the city drinking water by installing an auxiliary heat exchanger between the drinking water inlet and the refrigeration cooler. See Fig. 11. For example, city water at 80F need not be cooled down to 50F by a refrigeration machine. City water at 80F can be cooled down to 60F by means of a heat exchanger in which the cooling water is well water at 55F. Thus the refrigeration machine need be a fraction of its size as it is only necessary to cool the water from 60F to 50F instead of from 80F to 50F. By using well water as a supplementary means for cooling, the objections to its use are overcome.

(1) The drinking water is the city tap water. It is low in bacteria count as it is the water which the municipality checks periodically and the health department is responsible for its quality.

(2) By pumping deep well water out of the ground and by drilling another well and returning it to the ground, Fig. 11, at another spot on the property, approval from the municipality can in many instances be obtained for drilling of the wells.

(3) No problem of undesirable taste or odor of the well water exists, as the well water is not used for drinking purposes.

Absorption

Where waste steam at low pressure (12 lb gage) is available, Carrier has developed an absorption machine which may be used in large hotels and office buildings. And the use of cool drinking water may be combined with the requirements for air conditioning of the building by this modern type of absorption machine. The Carrier machine consists of a cooler or evaporator, absorber, heat exchanger, generator condenser, and eductor. It uses steam or other low priced heat, whichever is most available.

The Carrier absorption machine for chilled water operates on the continuous absorption principle, lithium bromide absorbing water vapor. The details of the operation of this machine are beyond the scope of this article. It is significant, however, that the absorption machine may play a major role in the water cooling art in the near future.

Use of the Heat Pump

Another method for cooling drinking water has been suggested, ironically, by the research on heating of water rather than that of cooling. The work was carried on by the Utilities Research Commission of which Commonwealth Edison of Chicago is one of the sponsors. Mr. Oldacre of that commission reports the use of a refrigeration compressor which in its role as a heat pump gives results which are very encouraging. The refrigeration machine goes through a normal refrigeration cycle. The heat removed from the hot compressed refrigerant vapor is transferred to the water. This water reaches a temperature of about 140F when the ambient temperature is about 90F. The ratio of the heat absorbed by the water to the heat equivalent of the kilowatt-hour input to the compressor motor is almost three to one. Obviously this means that three times as much heat may be obtained for the same electrical energy consumed as can be obtained with electric resistance heaters.

Fig. 12 shows such a system in which both hot and cold water are produced. It is of utmost importance in the use of the heat pump for the simultaneous cooling and heating of water to make a survey of the requirements of the installation in order to make certain that there is a balanced demand of both the hot and cold water available—hot water for washing purposes and cold water for drinking or air conditioning purposes. For every gallon of 80F water warmed to 140F, there is available about 1½ gallons of water cooled from 80F to 50F. Can the prospective customer utilize both? If so, a very economical installation can be arranged.

Economy of operation seems to be the keynote in the design and selection of equipment for the cooling of drinking water. Controls have been developed to a point of extreme reliability and compressors of the hermetic type (which eliminates the chance for leaks of refrigerant) are also becoming more reliable and are being produced for larger capacities as time goes on. It is economy and simplicity which are given the greatest consideration today when one is interested in the selection of a system.

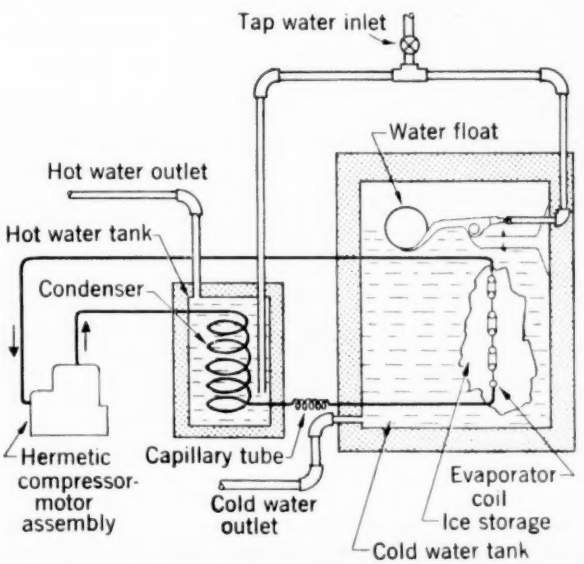


Fig. 12. Both hot and cold water are produced by this system.

Performance of Inertial Collectors

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A discussion of fundamental factors in the performance of inertial collectors for the removal of particulate material. Tables present performance data for a number of collectors based on both field tests and manufacturers' ratings. Much of this data was obtained under Atomic Energy Commission Contract AT and was presented at the Governor's Conference on Air Pollution in New Jersey.

THE dust or particulate separator which depends upon gravitation, centrifugal or inertial forces is perhaps the most widely applied type of air and gas cleaning equipment in use today for the removal of particulate material. Historically and economically it represents the simplest means of high efficiency removal of suspensoids down to as small as 20 microns in size and less.

The fundamental forces applied in inertial separators are gravitational or centrifugal. The unit which primarily applies gravitational forces is the settling or plenum chamber. This device is limited to separating large particles, those greater than 50 microns.

The inertial or centrifugal collector utilizes a change in direction produced either by a baffle or by causing the gas to rotate in a circular or spiral path. This rotation may be produced by the shape of the chamber or may be mechanically induced by a rotating member such as a fan blade.

The application of inertial collectors in industry covers almost every conceivable material which may be conveyed by a gaseous medium. A large number of units are not involved in atmospheric pollution control because they are applied to pneumatic handling and process material recovery. In many cases the items handled are as large as one inch in diameter. One of the earliest applications of inertial separators has been the wood working industry where sawdust and shavings are collected. The inertial collector can be designed to handle fine dusts but its widest application in air pollution control work is the removal of most of the process effluent by weight if the contaminant consists primarily of particulates over 10 microns in size.

There are many instances where an inertial collector may be adequate and the only type needed for satisfactory control. It may also be desirable to incorporate them as a primary collector for bulk removal to be followed by a secondary unit for extraction of finer particles. In some applications the inertial collector may be utilized as an agglomerator for other types of collectors and it is sometimes used as a classifier for separating particulates into size fractions. Their application to air pollution control problems requires a knowledge of the particle size spectrum of the material to be recovered.

*Numbers in parenthesis refer to the bibliography unless otherwise indicated.

TABLE 1—PARTICLE SIZE SEPARATED AS RELATED TO CHAMBER DIMENSIONS

Diameter in Microns of Quartz Particles (Specific Gravity 2.65)	Chamber Height (h) Chamber Length (l) At Horizontal Velocity of 60 fpm
100	1.33
87	1.00
50	0.33
25	0.085
10	0.013
1	

Fundamental Factors in Performance

There are three fundamental and practical considerations in the operation of any inertial collector. These factors are the minimum size of particle to be separated; the pressure loss or resistance of the collector; and the life and maintenance features of the unit. A discussion of inertial types with these characteristics described briefly is presented.

Since the gravitational separator is the most rudimentary type of separator a few words might be said about its operating principles. In essence this unit depends upon gravity forces for collecting particles. All particles larger than a few hundredths of a micron in size are influenced by gravity. Its effect of course, is directly related to particle mass. In a settling chamber, if given ample time, all particles except extremely small ones will settle. If suspended in an air stream, particles will settle along a path influenced by both their forward and settling velocities. Unless such chambers are made of extreme proportions or have a very small height in proportion to length, only the largest size particles will be removed. Ordinarily, such chambers are used to remove chips or large particles. Those as small as the finest screen sizes (325 or 400 mesh) require extremely large chambers or special types such as the Howard Dust Chamber (1).*

If the height of the chamber is h and its length is l, then the actual particle size separated in relation to chamber dimension at practical velocities (60 fpm) is given in Table 1 (2).

In simple chambers, therefore, the dimensions yield uneconomical proportions for particles smaller than 50μ. The Howard Chamber uses horizontal plates closely spaced to give a very low h/l ratio and it is claimed particles as small as 10μ can be removed. This device is difficult to clean and has been principally applied to sulfuric acid droplets.

The pressure loss through a settling chamber is quite low since only expansion and contraction losses and relatively low velocities are involved. In practice usually 1.5 to 2.0 outlet velocity heads represent the overall loss involved. (Entrance loss 1.0 h_v and exit 0.5 h_v plus

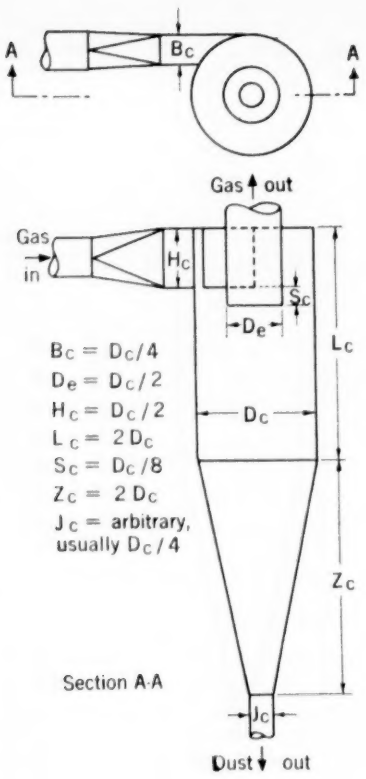

Fig. 1. Typical cyclone proportions.

possible resistance loss in straight section.) Because of the low velocities involved, the life of settling or gravitation chambers is several years since little abrasion can take place at their low operating velocities.

The centrifugal collector in its simplest form is the cyclone. Here the rate of dust precipitation is increased over that produced by gravity by applying radial acceleration from centrifugal motion.

A typical cyclone is shown in Fig. 1. The proportions given are based on a design widely used but like all such relatively simple devices, there are many variants each with certain advantages and limitations. Some other forms of simple types recently studied in our laboratory for resistance and collection efficiency are shown in Fig. 2. Complex cyclones have special inlet designs and components which may be stationary or rotating to control the flow path. Compound cyclones have flow paths divided into separate chambers by baffles where concentrated acrosols can receive special treatment. Complex or compound cyclones usually do not justify their involved design economically.

Four major factors are involved in simple cyclone design:

(1) The maximum radial distance of travel before separation is effected.
(2) Radius of curvature of the rotating air path.
(3) Inlet air velocity.
(4) Angular distance of air travel in the cyclone body.

The first two should be minimal and the last two maximal for peak efficiency.

The path that the rotating air takes in a cyclone is illustrated in Fig. 3. It is based on an exhaustive study in this laboratory by one of our doctorate candidates (3). The air paths in simple types are now well defined. In this figure x/r represents the ratio of radial distance from cyclone centerline x to cyclone radius r; Y/L is the vertical location from the top Y in ratio to cyclone cylinder height L, (3). In a typical cyclone of commercial design, dust separation of all sizes is effected near the wall but only those particles large in size or mass can travel to the wall in the presence of a given centrifugal acceleration. For practical purposes most of the dust is removed in the first 270 deg of travel.

It has been shown that the separating force is inversely proportional to the cyclone radius. There has been a wide application of this fact which has resulted in application of smaller diameter units placed in parallel operation. The Multiclone unit, Fig. 4 and 5, was an early design incorporating this principle and is widely used today. Other small diameter types have been marketed and show high separation efficiencies, (Fig. 6 is for a 2-inch cyclone) as compared to the older large diameter types. Smaller size tubes, of course, have less radial travel distances and produce minimum turbulence and eddies.

Based on fundamental considerations, the writer (4) and others have shown that the minimum size particle separated (d min.) at 100% efficiency, is dependent upon the radial separating distance S, cyclone diameter D, number of revolutions N, diameter of exit duct E and the pressure loss h. This is expressed in the form:

$$d\ (\text{min}) = a \sqrt{\frac{S\ D}{N\ E}} \left(\frac{1}{\sqrt{h}}\right)^{1/2}$$

Where a = a constant for a given dust and air conditions.

The terminal velocity can also be used instead of particle size since this factor also includes particle shape and specific gravity factors.

The pressure loss through cyclones is a function of inlet dimensions and cyclone proportions. In our laboratory, Dr. First (3) has extended Shepherd and Lapple's study (5) and has evolved the following equation in terms of inlet velocity heads:

$$F = \frac{12\ \frac{b}{k}\ \frac{h}{e^2}}{\left(\frac{L}{D}\right)^{1/3} \left(\frac{H}{D}\right)^{1/3}}$$

where F = Energy loss in number of inlet velocity heads
b = Entry width, feet
h = Entry height, feet
e = Exit duct diameter, feet
L = Cyclone cylinder height, feet
H = Cyclone cone height, feet
D = Cyclone cylinder diameter, feet
k = Entry vane factor with values as follows:
½ for cyclones without entry vane
1 for cyclones with entry vane
2 for cyclones with entry vane extending to exit duct wall

This equation fits the cyclone types shown in Fig. 2. When an inlet vane is employed, the value of the constant is reduced markedly and hence resistance losses are

lower. However, our studies also indicate a lower efficient in such cases.

The life of cyclones is dependent upon the abrasion characteristics of the dusts and the corrosiveness of the gas in which the dusts are suspended. Small diameter cyclones are subject to much more wear than larger diameter units. The multiclone units utilize a heavy cast iron wall to extend operating life. One of the most desirable features of cyclones are their ability to operate at high temperatures which makes them useful for hot processes. The only major limitation in terms of operating characteristics is that some materials may cake and create cleaning problems. Cyclonic separators can also be applied to wet particulates such as acid mists where larger sizes are involved.

There are many other structural types in addition to those shown and described here. These may vary in body proportions and angles for certain desired effects. Actually, these variations have little effect on performance.

Other Types of Inertial Separators

In addition to cyclones there are several other types of inertial separators. A simple baffle plate type and a more complex converging jet type are shown by Drinker and Hatch (2). A recently introduced type contains a series of 360 deg turns in the form of a large helix. It may be used dry or with a water seal.

The use of rotating members is almost as old as the centrifugal or curved path principle. The Rotoclone and cinder fan are examples of this type. One fairly new type is the Aerodyne unit that is shown in Fig. 7. This device acts as a concentrator and utilizes a louvered conical tube as the primary separator and a small cyclone

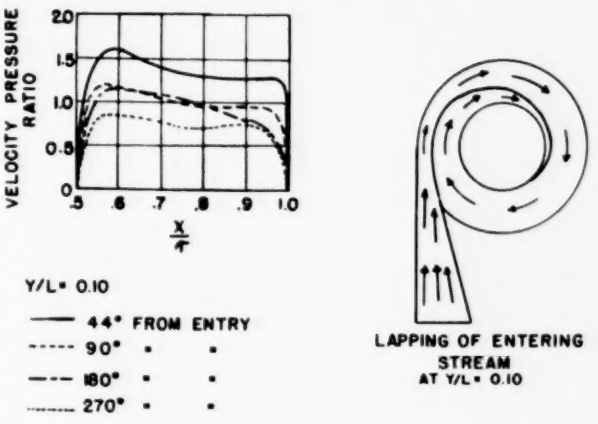

Fig. 3. Velocity characteristics of cyclone.

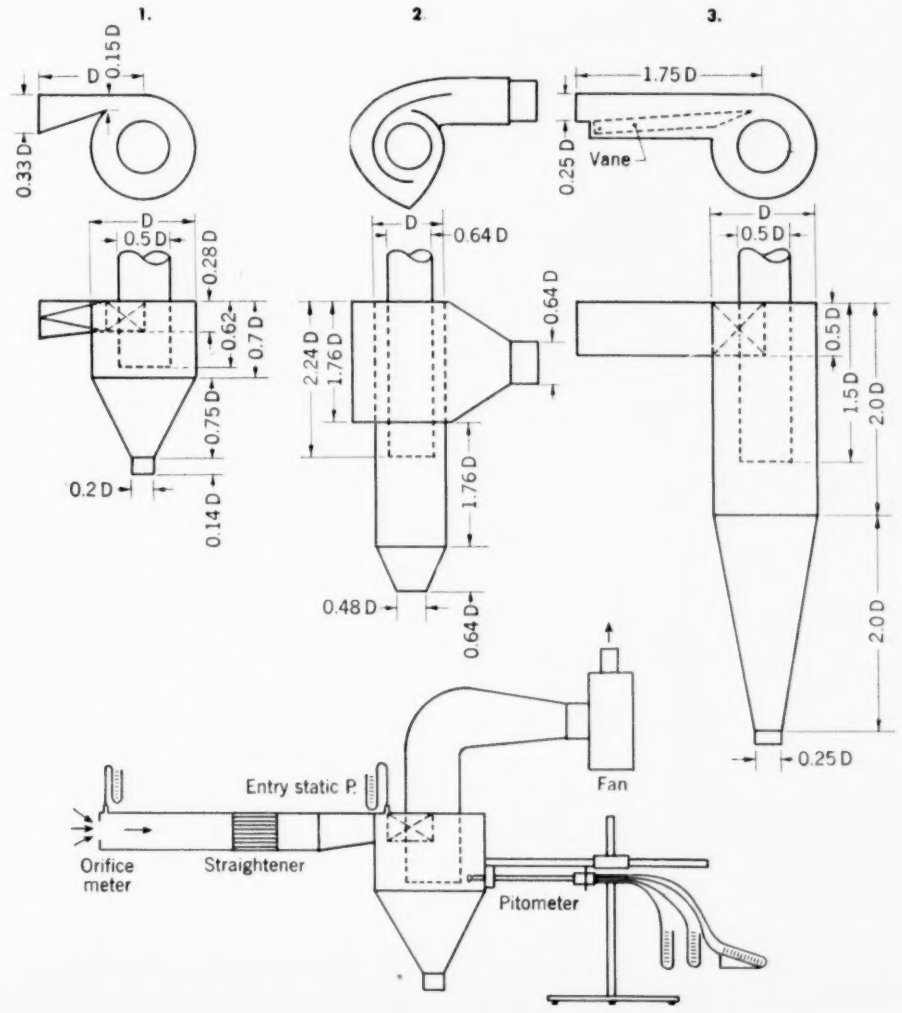

Fig. 2. Types of cyclones on which pressure loss equation is based—(1) typical simple cyclone; (2) double entry cyclone; (3) long body cyclone with movable entry vane. Test arrangement for determining velocity contours used by First is shown in lower sketch.

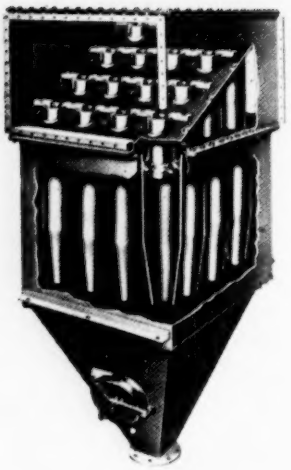

Fig. 4 (left). Small radius cyclone body (multiclone). Fig. 5 (right). Multiclone assembly.

handling 1/10 the total air volume as final collector. Its advantages are low resistance with efficiencies close to small diameter cyclones. They are highly susceptible to dust loading variations. As shown in Fig. 7, dusty air entering is separated at the louvers and passes along the cone to the cyclone. The cyclone effluent is returned to the main stream for further effluent concentration. In Fig. 7—

A = Lower cone for primary concentration and separation.
B = Chamber and hopper for primary cone.
C = Discharge point from primary cone.
D = Exhaust for drawing dust concentrated air from primary cone to cyclone.
E = Cyclone for separation of dust from air concentrated at cone.
F = Cyclone hopper.

The resistance losses for these units is comparable to small diameter cyclones. Separating efficiency may range from values equal to small diameter cyclones to results obtained with large diameter cyclones.

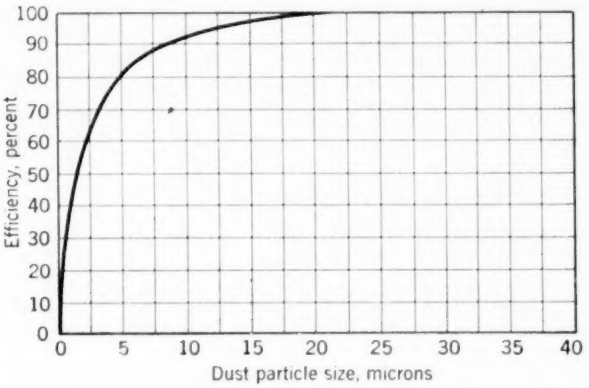

Fig. 6. Separation curve for small diameter based on particle size.

TABLE 2—PERFORMANCE OF SMALL CYCLONES—UNDER ONE FOOT DIAMETER

Device	Manufacturer	Test Aerosol	Inlet Concentration, Grains per Cu Ft	Particle Size at Inlet, Microns (Mass Median)	Particle Size at Exit, Microns (Mass Median)	Efficiency, Weight, %	Resistance, Inches Water	Inlet Velocity, FPM	Flow Rate, CFM	Remarks
Multiclone, Mfrs. Rating	Western Precipitation, Inc.	Flyash Portland cement	..	8.3	..	80 83 (9-inch tubes)	3—4 (rated)	..	..	Group of 6-inch or 9-inch vaned cyclone tubes incorporated in a single unit.
Aerotec, Field Test	Aerotec Co.	Coal flyash (elutriates)	..	0—7.5 7.5—10 10—15	..	75.0 90.9 95.0	1—4 (rated)	..	..	Snell (3-inch, 2-inch, or 1½-inch) cyclone tubes incorporated in a single unit.
		Sp. gr. 2.1 and air temp. 400F	..	2.5 5.0 10	..	36 72 87	2 (rated)	..	..	
Thermix Tubular Dust Collector, Mfrs. Rating	Prat Daniel Corp.	Coal flyash (elutriated)	..	0—7.5 7.5—10 10—15	..	40 66.5 79.5	0.5—4 (rated)	..	..	6-inch cyclone tube incorporated in a single unit.
Van Tongeren Cyclone, Mfrs. Rating	Buell Engineering Co.	Sp. gr. of 2.0	to 300	0—5 5—10	..	49 76	..	3,000	..	Installation may be of single or multiple units. Each unit is approximately 4 ft long and 10 inches in diameter.
Ideal Dust Collector, Mfrs. Rating	Ideal Industries, Inc.	Graded abrasive	..	22 38	..	97.4 99.3	..	5,400	..	Two 8-inch diameter cyclones in unit containing blower.

Performance of Inertial Collectors

The performance characteristics of several types of cyclones and other inertial collectors are presented in Tables 2, 3, and 4. These data are largely based on field measurements obtained by our laboratory. In a few cases of special types, manufacturer's data are indicated. The techniques involved in collecting this information is detailed in a recent article (6).

Data shown in these tables indicates the following important facts. The efficiency for large diameter cyclones is primarily dependent upon inlet particle size and to a limited degree on inlet dust loading. Increased inlet velocity improves efficiency but also increases resistance loss. Efficiencies are less than 90% even for particles as large as 10 microns.

Efficiencies and Velocities

When the cyclone diameter is reduced to a small size, more effective collection results as shown in Table 2. It will be noted, however, that this collection is at the expense of increased resistance or pressure loss. As might be predicted, these higher efficiencies are due to increased inlet velocities and smaller travel distance. It is then obvious that abrasion and wear will be greater in these units.

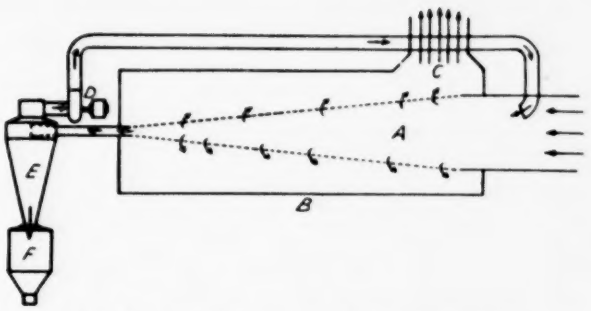

Fig. 7. Aerodyne type of dust concentrator.

No relation was observed between inlet concentration and efficiency although laboratory studies have shown some improvement at higher loadings.

The effectiveness of other types is presented in Table 4 and it can be seen that these data are comparable to those in Table 2. Resistance losses on mechanically driven units are difficult to assess in field studies as these devices act as air movers as well as separators.

TABLE 3—PERFORMANCE OF LARGE DIAMETER CYCLONES

Device	Manufacturer	Test Aerosol	Inlet Concentration, Grains per Cu Ft	Particle Size at Inlet, Microns (Mass Medium)	Particle Size at Exit, Microns (Mass Median)	Efficiency Weight, %	Resistance, Inches Water	Inlet Velocity, FPM	Flow Rate, CFM	Remarks
Cyclone, Field Test	....	Silicon carbide and aluminum oxide dust in air from truing and shaping of abrasive products	0.36	10.6	5.8	58	..	6,180	6,180	7 ft diameter tangential inlet and outlet ducts
Cyclone, Field Test	American Blower Corp.	Dust laden air from sand and gravel bucket elevators, drying kiln, screening tower and hot asphalt mixing operations	38	8.5	7.1	86	1.9	2,000	12,300	9 ft diameter Gas at 240F
Sirocco No. 20 Cyclone, Field Test	American Blower Corp.	Air from stone drying kiln	16.8	5.1	1.3	86	..	1,700	4,600	Gas at 230F
Sirocco No. 20 Cyclone, Field Test	American Blower Corp.	Air from sand drying kiln	18.7	6.3	2.5	78	..	1,700	4,600	Gas at 230F
Cyclone, Field Test	Plant Construction	Wood dust from planing mill operations	0.1	99% > 500 (weight)	..	97	3.7	3,100	3,500	6.5 ft diameter
Cyclone, Field Test	Plant Construction	Aluminum dust from grinding operations	0.7	99% > 500 (weight)	..	89	1.2	1,400	4,400	6 ft diameter
Cyclone, Field Test	Plant Construction	Cotton flock	0.7	99% > 500 (weight)	..	88	1.6	2,400	2,600	6.5 ft diameter
Cyclone, Field Test	Plant Construction	Talc dust from abrasive-cleaning operation	2.2	128	..	93	0.33	1,000	2,300	7 ft diameter
Cyclone No. 10 Standard, Field Test	B. F. Sturtevant Co.	Flyash (sp. gr. 2.4)	3.4	70% passing 325 mesh (44μ actual diameter)	..	98	2.5	3,500	1,900	Air at room temperature

TABLE 4—PERFORMANCE OF OTHER INERTIAL SEPARATORS

Device	Manufacturer	Test Aerosol	Inlet Concentration, Grains per Cu Ft	Particle Size at Inlet, Microns (Mass Median)	Particle Size at Exit, Microns (Mass Median)	Efficiency, Weight, %	Resistance, Inches Water	Inlet Velocity, FPM	Flow Rate, CFM	Remarks
Cindertrap, Mfrs. Rating	Green Fuel Econimizer Co.	Coal cinders in boiler flue gas	Efficiency substantially independent	> 43	..	17-30	0.1-0.3	1,200-1,500	..	Consists of batteries of vertical steel elements obstructing gas flow through a large chamber. Used for removal of coarse cinders from flue gasses.
Type S Collector, Mfrs. Rating	Hudson H. Bubar Co.	Flyash	..	85% > 43	..	80	0.06	..	..	Consists of banks of vertical traps set at an angle to gas flow through a large chamber.
Aerodyne (Type C), Field Test	Pusey & Jones Corp.	Effluent from cyclone cleaning dust laden air from sand and gravel bucket elevators, drying kiln, screening tower and hot asphalt mixing operations	5.8	5.3	1.8	50	4	1,740 (inlet to Aerodyne)	12,300	Conical tubes which concentrate dust before it passes to cyclone. 4-8 ft cones with 10% recycle to small cyclone. Temperature was 240F.
Aerodyne (Type cc) Field Test*	B & S Fabricators	Dicalite (a filter aid of low density)	0.394	2	..	76.2	..	..	3,280	A two-stage Aerodyne, i.e., two units in series.
		Silica parting compound	0.352	1.3	..	93.5	..	..	"	
		Iron oxide paint pigment	0.544	0.5	..	94.7	..	..	"	
		Flyash	1.06	Coarse	..	98.7	..	..	"	
Rotoclone Type D, Field Test	American Air Filter Co.	Fluffy zinc stearate from rubber dusting operation	0.6	1.75	..	88	..	..	3,300	Mechanical drive unit.
Rotoclone Type D, Field Test	American Air Filter Co.	Fluffy zinc stearate from rubber dusting operation	1.7	1.75	..	78	..	..	750	Mechanical drive unit.

*Work done by Detroit Department of Health.

Conclusions

The use of inertial separators should be confined to particulate matter with size characteristics which can be predicted or evaluated. They show high weight retention on particulates over 10 microns and will give trouble free service at moderate capital and operating costs. Their efficiency is related to pressure loss and structural dimensions.

In applying these devices to air pollution control problems it should be borne in mind that they will eliminate nuisance problems created by local settling of coarse materials. They should not be applied to fume or smoke control problems unless followed by a secondary collector. If applied to mixed dust and fume conditions they may remove the bulk of the material by weight but still permit enough fine materials to pass to create a smog or light obscuration problem if very large air volumes are discharged.

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Flow and Fan—

Principles of Moving Air through Ducts

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Part 2. Pressure and Loss Calculations

Continuing his discussion of flow of air through ducts, the author presents the basic considerations in loss calculations in this second part of a twelve-part series.

WHEN a duct system is tested, the static pressure and the velocity pressure are measured in inches of water. In some cases, they are needed in pounds per square foot, psf.

$$(\text{inches of water}) \times 5.19 = \text{psf} \qquad (19)$$

There are also occasions when it is desirable to express the heads in feet of fluid, as they appear in the first form of the Bernouilli equation.

$$\frac{(\text{pressure, in psf})}{(\text{density of the fluid, lb/cu ft})} = (\text{head in feet of fluid}) \qquad (20)$$

For the special case of standard air, density = 0.075 lb per cu ft, this becomes

$$\frac{(\text{inches of water}) \times 5.19}{0.075} = (\text{inches of water}) \times 69.2 = (\text{head in feet of fluid}) \qquad (21)$$

(The factor 69.2 is the quantity that we evaluated as approximately 70 ft on an earlier page.)

When a duct system is being designed, measurements are of course impossible, and the static pressure and velocity pressure at various points must be computed. The general method is to start at some point where the total pressure is known, and to proceed along the duct, subtracting the successive losses if we are moving downstream, adding the losses if we are moving upstream, and thereby computing the total pressure at various points along the stream. The velocity pressure is computed at each of these points (as outlined below), and the static pressure is found by subtracting the velocity pressure from the total pressure.

$$(\text{total pressure}) = (\text{static pressure}) + (\text{velocity pressure}) \qquad (22)$$

Since we are now using static pressure and total pressure as gage pressures (except in unusual situations), it must be noted that either or both of them may be negative (i.e., absolute pressure below atmospheric). This requires care to avoid errors, especially in view of the fact that many workers, in dealing with a system that is entirely under suction, customarily omit the minus signs.

Velocity pressure is always positive.

Velocity and Velocity Pressure

When velocity pressure is measured in a test, the velocity must be computed from the observed velocity pressure. In a design, the velocity is computed as $V = Q/A$, and the velocity pressure must be computed.

As has already been noted, various units are in common use, and hence there will be several formulations. We shall present them all, and indicate those that are most commonly used. The others may be useful in occasional problems.

The starting point is the definition of velocity head:

$$\text{Velocity head} = \frac{V^2}{2g} = \frac{V^2}{64.35} = \left(\frac{V}{8.02}\right)^2 \qquad (23)$$

$$V = 8.02\sqrt{\text{velocity head in feet}} \qquad (24)$$

where V is in fps, head in feet of fluid.

If the velocity is expressed in fpm, this becomes

$$\text{Velocity head} = \frac{V^2}{2\,g\,3600} = \frac{V^2}{231652.} = \left(\frac{V}{481.3}\right)^2 \qquad (25)$$

$$V = 481.3\sqrt{\text{velocity head in feet}} \qquad (26)$$

where V is in fpm, head in feet.

Pressure equals head multiplied by density. We shall use the symbol h_v for the velocity pressure.

$$h_v = \frac{\rho V^2}{2g} = \rho\left(\frac{V}{8.02}\right)^2 \qquad (27)$$

$$V = 8.02\sqrt{\frac{h_v}{\rho}} \qquad (28)$$

where V is in fps, h_v in psf.

For special case of standard air, $\rho = 0.075$, and

$$h_v = \frac{V^2}{858} = \left(\frac{V}{29.3}\right)^2 \qquad (29)$$

$$V = 29.3\sqrt{h_v} \qquad (30)$$

where V is in fps, h_v in psf, $\rho = 0.075$.

Repeating for velocity expressed in fpm,

$$h_v = \frac{\rho V^2}{2\,g\,3600} = \rho\left(\frac{V}{481.3}\right)^2 \qquad (31)$$

$$V = 481.3\sqrt{\frac{h_v}{\rho}} \qquad (32)$$

And again for standard air,

$$h_v = \left(\frac{V}{1758}\right)^2 \tag{33}$$

$$V = 1758\sqrt{h_v} \tag{34}$$

where V is in fpm, h_v in psf, $\rho = 0.075$.

The velocity pressure, expressed in inches of water, equals the psf value divided by 5.19, which gives

$$h_v = \frac{\rho V^2}{2g\,5.19} = \frac{\rho V^2}{334} = \rho\left(\frac{V}{18.28}\right)^2 \tag{35}$$

$$V = 18.28\sqrt{\frac{h_v}{\rho}} \tag{36}$$

where V is in fps, h_v in inches of water.

For standard air, density = 0.075

$$h_v = \frac{V^2}{4453.} = \left(\frac{V}{66.73}\right)^2 \tag{37}$$

$$V = 66.73\sqrt{h_v} \tag{38}$$

where V is in fps, h_v in inches of water, $\rho = 0.075$.

And finally, with velocity expressed in feet per minute, we arrive at the equations that are commonly used. These, and these alone, are worth remembering.

$$h_v = \frac{\rho V^2}{1.202{,}394} = \rho\left(\frac{V}{1096.5}\right)^2 \tag{39}$$

$$V = 1096.5\sqrt{\frac{h_v}{\rho}} \tag{40}$$

where V is in fpm, h_v in inches of water.

For standard air these become

$$h_v = \frac{V^2}{16{,}031{,}918} = \left(\frac{V}{4004}\right)^2 \tag{41}$$

$$V = 4004\sqrt{h_v} \tag{42}$$

where V is in fpm, h_v in inches of water, $\rho = 0.075$.

Since the last two cases embody the units that are commonly used in practice, they present the equations that are almost always used. The numbers 1096 and 4004 (often used as 4000 for simplicity) should be remembered.

Abrupt Expansion

In order to complete the next step in this discussion, we need to know about abrupt expansion, which logically belongs later, in the discussion of losses. We shall mention what is needed at the moment, and return to the subject later for a more complete study.

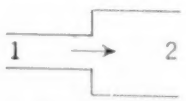

Fig. 7. Abrupt expansion.

Consider a duct having a sudden enlargement in the direction of flow. Continuity tells us that the upstream velocity must be higher than the downstream velocity. Evidently a high-speed stream of gas runs into a slower-moving body of gas, and severe turbulence results immediately following the abrupt expansion. A short distance downstream, however, experimental studies indicate that the gas velocity becomes virtually uniform across the area of the duct, and this circumstance enables us to compute various quantities by means that give results that check experimental measurements within the limits of error of the measurements.

Evidently there is a reduction in the velocity head (or velocity pressure), and we should therefore expect an increase in the pressure head (or static pressure), but the process involves a loss of head (a decrease in total pressure) so that the increase in pressure head (static pressure) is less than the decrease in velocity head (velocity pressure).

The basis of computing these items is that the fast and slow bodies of gas combine in inelastic impact. Momentum is conserved. Energy is lost. We shall not examine the derivation in detail, but shall merely present the results, which may be accepted with confidence.

The loss due to abrupt expansion is expressed by what is known as the Carnot-Borda equation, or more simply as the Borda equation. The loss is often called the Borda loss.

$$H_L = \frac{(V_1 - V_2)^2}{2g} \tag{43}$$

where V is in fps, H_L is total head loss in feet of fluid.

Note that this loss depends upon the square of the difference beween the velocities, *not* the difference between their squares. It is the square of the velocity lost, divided by 2g.

Numerical values can be worked out for various units just as we have done for the velocity head and velocity pressure. The form and the numerical values will be the same for each set of units, so there is no point in repeating the entire list. We come at once to the commonly used units.

$$h_L = \rho\left(\frac{V_1 - V_2}{1096.5}\right)^2 \tag{44}$$

where V is in fpm, h_L in inches of water loss in total pressure.

For standard air,

$$h_L = \left(\frac{V_1 - V_2}{4004}\right)^2 \tag{45}$$

where V is in fpm, h_L in inches of water loss in total pressure, $\rho = 0.075$.

Now that we know the loss accompanying abrupt expansion, we can apply Bernouilli's equation to compute the change in static pressure. It will be most convenient to do this in terms of head, in feet of fluid, with velocities expressed in feet per second. We shall use the symbol H_s for the pressure head, p/ρ.

$$H_{s1} + \frac{V_1^2}{2g} = H_{s2} + \frac{V_2^2}{2g} + H_{L\,1.2} \tag{46}$$

$$H_{s1} + \frac{V_1^2}{2g} = H_{s2} + \frac{V_2^2}{2g} + \frac{(V_1 - V_2)^2}{2g} \tag{47}$$

$$H_{s2} - H_{s1} = \frac{V_2^2}{2g} - \frac{V_1^2}{2g} + \frac{(V_1 - V_2)^2}{2g} \tag{48}$$

$$= \frac{V_2^2}{2g} - \frac{V_1^2}{2g} + \frac{V_1^2 + V_2^2 - 2V_1V_2}{2g} \tag{49}$$

$$= \frac{2V_2^2 - 2V_1V_2}{2g} \qquad (50)$$

$$\triangle H_s = \frac{V_2\,(V_1 - V_2)}{g} \qquad (51)$$

where V is in fps, $\triangle H_s$ in feet of fluid.

This is the increase in pressure head (feet of fluid) accompanying abrupt expansion. Note that the denominator is one g, not two g.

This pressure-head rise can also be expressed in the various assortments of units that we have already considered.

$$\triangle H_s = \frac{V_2(V_1-V_2)}{g\,3600} = \frac{V_2(V_1-V_2)}{115.826} \qquad (52)$$

where V is in fpm, $\triangle H_s$ in feet of fluid.

$$\triangle h_s = \frac{\rho\, V_2(V_1-V_2)}{g} \qquad (53)$$

where V is in fps, $\triangle h_s$ in psf.

$$\triangle h_s = \frac{0.075\, V_2(V_1-V_2)}{g} = \frac{V_2(V_1-V_2)}{429} \qquad (54)$$

where V is in fps, $\triangle h_s$ in psf, $\rho = 0.075$.

$$\triangle h_s = \frac{\rho\, V_2(V_1-V_2)}{g\,3600} = \frac{\rho\, V_2(V_1-V_2)}{115,826} \qquad (55)$$

where V is in fpm, $\triangle h_s$ in psf.

$$\triangle h_s = \frac{0.075\, V_2(V_1-V_2)}{g\,3600} = \frac{V_2(V_1-V_2)}{1,544,000} \qquad (56)$$

where V is in fpm, $\triangle h_s$ in psf, $\rho = 0.075$.

$$\triangle h_s = \frac{\rho\, V_2(V_1-V_2)}{g\,5.19} = \frac{\rho\, V_2(V_1-V_2)}{167} \qquad (57)$$

where V is in fps, $\triangle h_s$ in inches of water.

$$\triangle h_s = \frac{0.075\, V_2(V_1-V_2)}{g\,5.19} = \frac{V_2(V_1-V_2)}{2227} \qquad (58)$$

where V is in fps, $\triangle h_s$ in inches of water, $\rho = 0.075$.

$$\triangle h_s = \frac{\rho\, V_2(V_1-V_2)}{g\,5.19\times 3600} = \frac{\rho V_2(V_1-V_2)}{601,200} \qquad (59)$$

where V is in fpm, $\triangle h_s$ in inches of water.

$$\triangle h_s = \frac{0.075\, V_2(V_1-V_2)}{g\,5.19\times 3600} = \frac{V_2(V_1-V_2)}{8,016,000} \qquad (60)$$

where V is in fpm, $\triangle h_s$ in inches of water, $\rho = 0.075$.

As for the values of velocity pressure, only the last two of these forms use the common units. The denominators may be used as 600,000 and 8,000,000 without serious error, and are easily handled on the slide rule. If the velocities be taken in thousands, then the denominators become 0.6 and 8.0, respectively.

This increase in static pressure accompanying abrupt expansion is commonly called the *static pressure regain*, or simply the *regain*, due to abrupt expansion. Experiment indicates that this value, computed from simple mechanical principles, is actually realized in practice, with gas flow, within the limits of error of the measurements.

Abrupt Expansion to Zero Velocity

An important case is gas flow from a confined duct into a space that is substantially infinite, such as the open atmosphere or a large room. The velocity following this abrupt exit of the gas is virtually zero.

The drop in total pressure equals the loss due to abrupt expansion

$$\frac{(V_1-V_2)^2}{2g} = \frac{V_1^2}{2g} \longrightarrow h_{v1} \qquad (61)$$

The static pressure regain becomes

$$\frac{V_2(V_1-V_2)}{g} = 0 \qquad (62)$$

That is, whenever a stream of fluid emerges from a duct into a very large space, the loss (which is the drop in total pressure) equals the velocity pressure at the exit from the duct, and the static pressure regain is zero, that is, the static pressure within the duct exit is the same as that prevailing in the large space, which may be atmospheric pressure. Further, if the static pressure in the duct is expressed as gage pressure (the common custom), it will be zero if the duct discharges into the open atmosphere.

Pressures in a Duct System

Now we are ready to consider the method of finding the distribution of pressures throughout a duct system. We shall do this principally by means of numerical illustrations.

The first step is to determine all of the losses. Since the losses (apart from that due to abrupt expansion) are in terms of experimental factors (friction coefficients), the only available ways for finding the losses are to set up the apparatus (or a model) and test it, or, what is really the same thing, to look up values in some reference book, which reports experimental work done by others. On later pages we shall discuss the finding of losses of various sorts; in the numerical illustrations presented here we shall simply state the losses arbitrarily, and for the sake of clearness we shall make them larger than is common, to avoid small fractions.

The method, as set forth in the following illustrations, may be summarized in the following steps:

(1) Tabulate the duct areas at successive points which divide the system into sections each having a fixed nature, e.g., a straight run, an elbow, an abrupt expansion, or the like.

(2) For each of these points compute the velocity from the equation of continuity, $V = Q/A$.

(3) For each point compute the velocity pressure $(V/4000)^2$, in inches of water, for gas density = 0.075 lb per cu ft.

(4) For each interval between successive points, tabulate the losses, as found from tables, charts or other experimental data, or as computed for abrupt expansions.

(5) At the end of the duct remote from the fan, the total pressure is known to be zero (gage) in the open atmosphere. Starting with this value, work toward the fan, adding the successive losses in passing upstream, subtracting them in passing downstream, thereby securing the total pressures point by point.

(6) From each total pressure subtract the velocity pressure, to find the static pressure at that point.

$$h_t = h_s + h_v.$$

First Example

A fan, F, delivers air to and through the duct system sketched. Points 1 and 10 are in the free atmosphere well away from the system.

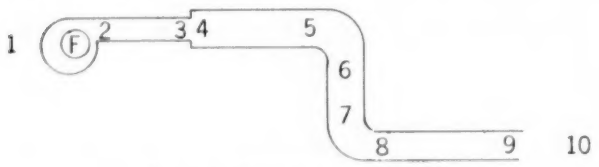

Fig. 8. Example system No. 1.

The rate of flow, Q, is 12,000 cfm. Other data are tabulated.

Item	Point									
	1	2	3	4	5	6	7	8	9	10
Area, sq ft	∞	3	3	5	5	4	4	4	4	∞
Velocity, fpm	0	4000	4000	2400	2400	3000	3000	3000	3000	0
h_v, inches water	0	1.0	1.0	0.36	0.36	0.56	0.56	0.56	0.56	0
h_L from tables		?			0.5	0.3	0.7	0.4	0.8	
h_L, computed				0.16						0.56
h_s, inches water	0	4.42	3.42	3.26	2.76	2.46	1.76	1.36	0.56	0
h_s, inches water	0	3.42	2.42	2.90	2.40	1.90	1.20	0.80	0	0
regain, inches			0.48							

The details of working out the foregoing table may need a word of explanation. The losses "from tables" represent values that would be found in tables or charts indicating the losses found in ducts, elbows, etc., of the sizes indicated, with the stated flow. The losses "computed" are the loss due to abrupt expansion (the Borda loss), computed as previously explained, and the loss at exit from the end of the duct, which equals the velocity head at that point, as explained for abrupt expansion to zero velocity.

The loss between points 1 and 2 is indicated by a question mark because the losses due to flow through the fan are embodied in the fan efficiency, a quantity that we shall discuss later in the study of the fan.

The losses having been tabulated, the line of total pressures was filled in from right to left, because at the right-hand end, at point 10, in the open atmosphere, we know that the total pressure is zero (gage pressure). Working upstream from that point, we add the successive losses to find the total pressures point by point. Subtraction of the velocity pressures gives the static pressures, since $h_t = h_s + h_v$.

Finally, the regain due to abrupt expansion is computed from the equation presented above, and checks (as it must) the difference in static pressure between points 3 and 4.

This illustration brings out a number of significant items. Between any two points at which the velocity is the same, the difference in static pressure is the same as the difference in total pressure, and equals the sum of the intervening losses. But between two points at which the velocity is different, the difference in static pressure is by no means equal to the intervening losses. See, for example, points 3 and 4, between which there is a loss of 0.16, while the static pressure *increases* from 2.42 to 2.90, a rise that checks the computation of the regain due to abrupt expansion. Again, between points 5 and 6 there is a loss of 0.3, but the static pressure drops from 2.40 to 1.90, a drop of 0.5 inch. Clearly, part of this drop in static pressure (0.2 inch) is due to the corresponding rise in velocity pressure.

From this tabulation we see at once the duty required of the fan. When delivering 12,000 cfm, it must develop a total pressure of 4.42 inches of water, a static pressure of 3.42 inches. When we come to the study of the fan we shall have more to say about the significance of total pressure and static pressure.

The sum of all the losses in this system (external to the fan) is 4.42 inches of water. This equals the total pressure that must be developed by the fan. This is always true for a fan located as a blower, that is, located at the entrance end of the system, and driving air through the system. The sum of all the system losses, including the loss due to abrupt expansion to zero velocity, at the exit end (a loss of the exit velocity pressure), equals the total pressure developed by the fan.

Second Example

Instead of locating the fan as a blower, as in the first illustration, let us locate the same fan as an exhauster, maintaining air flow through the same duct system.

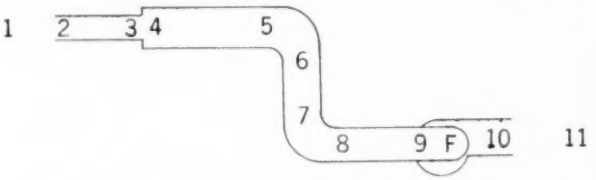

Fig. 9. Example system No. 2.

The rate of flow, Q, is still 12,000 cfm. The losses are the same as before, save for the new loss at entrance, between 1 and 2, and the exit loss, between 10 and 11.

Item	Point										
	1	2	3	4	5	6	7	8	9	10	11
A, sq ft	∞	3	3	5	5	4	4	4	4	3	∞
V, fpm	0	4000	4000	2400	2400	3000	3000	3000	3000	4000	0
h_v, in. W.	0	1.0	1.0	0.36	0.36	0.56	0.56	0.56	0.56	1.0	0
h_L, table	2.0	1			0.5	0.3	0.7	0.4	0.8	?	
h_L, comp.			0.16							1.0	
h_s, in. W.	0	-2.0	-3.0	-3.16	-3.66	-3.96	-4.66	-5.06	-5.86	+1.0	0
h_s, in. W.	0	-3.0	-4.0	-3.52	-4.02	-4.52	-5.22	-5.62	-6.42	0	0
Regain			0.48								

The procedure in this case is the same as before, except that the total pressures are filled in from left to right, beginning at point 1, and subtracting losses as we move downstream up to point 9. Point 10 is found by starting from point 11 and proceeding to the left, as in the first illustration.

In this case it must be noticed that the total pressures are negative (i.e., below atmospheric pressure) throughout the system up to the fan suction. It remains true that $h_s = h_t - h_v$, and this subtraction must be performed in

the usual algebraic sense, that is, in the direction of lower absolute pressure. Thus the static pressures are negative, and of larger absolute value than the total pressures. The absolute static pressure is always lower than the absolute total pressure. Velocity pressure is always positive.

We notice in this case that the fan is required to develop a total pressure of 6.86 inches of water. This is more than was required of the same fan serving the same duct system as a blower. The reason is twofold: (1) in this second arrangement there is a large loss at entrance, viz., 2 inches of water, which was not present in the first arrangement. This might have been eliminated by a better entrance construction, but it was not. (2) In this case the loss at exit is 1 inch of water, whereas in the first illustration it was only 0.56 inch of water, because in the first case the exit duct was larger, and the velocity was correspondingly lower.

In this second case, the sum of the losses in the system is 5.86 inches of water between point 1 and point 9, plus 1 inch exit loss at the fan discharge, giving a total of 6.86 inches of water. So it is true for this exhauster arrangement that *the sum of all the losses, including the loss due to abrupt expansion to zero velocity at the fan discharge, equals the total pressure developed by the fan.* Since this rule always holds, it is well to remember it, and it would doubtless be well if it were the only rule used in practice, but it is not. The difficulty that arises in practice is that the duct system is designed before the fan is selected, and hence the area of the fan discharge is not known, and the exit loss can not be evaluated. So it is widely customary to omit the exit loss from the sum of the losses, and (in this case) take the aggregate loss of the system exclusive of the fan to be 5.86 inches of water. We have reduced the aggregate loss by omitting the exit loss at the fan discharge; we must make the same reduction in the fan performance if we are to maintain the equality that was so convenient in the former rule (i.e., total loss = total pressure by fan). Therefore we have an arbitrarily defined quantity which is called the *fan static pressure*, which equals the total pressure developed by the fan, minus the velocity pressure in the fan discharge. We can then assert that for a fan located as an exhauster the aggregate loss of the duct system up to the fan equals the fan static pressure. Thus we can select a fan for a given duct system so soon as we know the aggregate loss of that system, and need give no thought to the velocity pressure that will be lost in the fan discharge.

Third Example

A fan located at some intermediate position in the system is said to be a booster. To simplify the illustration, we shall omit the details of the duct system since they would merely duplicate what we have already done. In this case, Q = 3000 cfm.

As in the previous illustrations, we have filled in the total pressures upstream of the fan starting from point 1 and subtracting losses as we progress downstream, and downstream of the fan we have started from point 6 and added losses as we progress upstream to the fan discharge.

We find that the total loss of the system, exclusive of the fan, is 9.14 inches of water, and we observe that this equals the total pressure developed by the fan, and that, in this case, it also equals the static pressure developed by the fan, but look out, this is not the "fan static pressure,"

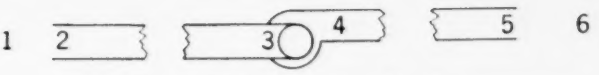

Fig. 10. Example system No. 3.

	Point					
Item	1	2	3	4	5	6
A, sq ft		4	2	2	3	
V, fpm	0	2000	4000	4000	2667	0
h_v, in. W.	0	0.25	1.0	1.0	0.44	0
h_L, in. W.		0.5	4.3	?	3.9	0.44
h_t, in. W.	0	−0.5	−4.8	4.34	0.44	0
h_s, in. W.	0	−0.75	−5.8	3.34	0	0

as previously defined. The "fan static" equals the total pressure developed by the fan (9.14 in this case) minus the velocity pressure in the fan discharge (1 inch in this case), so that the fan static in this case is 8.14 inches of water, and this is not directly related to the aggregate loss of the system external to the fan, nor does it equal the difference between the static pressures at fan suction and discharge.

It may appear that the situation is confusing. It is. We simply have to remember the relationships involved, and the artificial means commonly used in one special case. This gives us two rules for selecting a fan to serve a duct system:

(1) Whether the fan operates as a blower, booster, or exhauster, it is always true that the aggregate loss of the system, including the loss of one velocity head at exit, equals the total pressure developed by the fan.

(2) When the fan operates as an exhauster, the loss of one velocity head at the fan discharge may be dropped from consideration, whereupon the aggregate loss of the system external to the fan equals the fan static pressure.

This illustration is intended to set forth a single point, so the duct system is not shown in full detail. The fan will operate as a blower; similar results would follow if it were a booster or exhauster. In this case, Q = 12000 cfm.

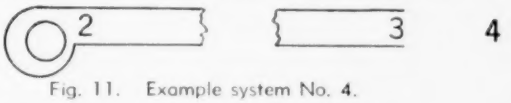

Fig. 11. Example system No. 4.

	Point			
Item	1	2	3	4
A, sq ft	∞	3	3	∞
V, fpm	0	4000	4000	0
h_v, in. W.	0	1.0	1.0	0
h_L, in. W.		?	4.0	1.0
h_t, in. W.	0	5.0	1.0	0
h_s, in. W.	0	4.0	0	0

The fan must develop a total pressure of 5 inches of water.

Now we shall modify this system by adding at the exit end a long tapering "évasé" followed by a short length of straight duct, for the purpose of reducing the velocity at exit, and hence the loss at exit. The system up to point 3 is unaltered.

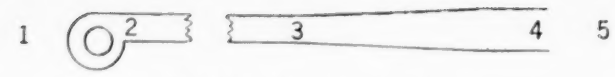

Fig. 12. Example system No. 5.

Item	Point 1	2	3	4	5
A, sq ft		3	3	6	∞
V, fpm	0	4000	4000	2000	0
h_v, in. W.	0	1.0	1.0	0.25	0
h_L, in. W.		?	4.0	0.2	0.25
h_t, in. W.	0	4.45	0.45	0.25	0
h_s, in. W.	0	3.45	−0.55	0	0

Here is a seemingly startling result. By adding this tapering enlargement to the end of the duct system, we have reduced the duty of the fan from 5 inches total pressure to 4.45 inches total pressure. Ten percent reduction in fan duty results from adding a length of duct of appropriate shape. Without this addition, the static pressure at point 3 was of course zero, but with the tapering addition, the static pressure at 3 has become negative, more than half an inch of water below atmospheric pressure. The mere fact that a duct system is discharging into the open atmosphere is by no means an indication that the static pressure within the duct is above atmospheric pressure. Velocity pressure enters the picture, and high velocity pressure establishes a presumption of low static pressure. Losses have an opposite influence.

For a given fluid, flowing through a fixed tube, when the velocity is low, the motion of the fluid is along stream lines parallel to the axis of the tube. This is called *laminar* or *viscous* flow. A tiny hypodermic tube introducing a supply of colored fluid to the stream will originate a thread of color passing downstream, which is easily visible in a stream of water flowing through a glass tube. There is no lateral mixing of the flowing fluid.

At higher velocities, a different pattern prevails. The fluid flows down the tube in a confused manner, with vigorous lateral components of velocity. The fluid, as it were, rolls along through the tube, with extensive lateral mixing. The hypodermic needle introducing colored fluid would give no visible trace; the colored liquid would seem to disappear instantly; actually it would be diluted by the entire stream. This kind of flow is called *turbulent*.

The boundary between laminar and turbulent flow cannot be defined in simple terms. There are several variables involved, such as the nature of the fluid, in particular its density and viscosity, the velocity of the fluid, and the size of the tube through which the fluid is flowing. This is not the place to study the details of the argument; the result was developed by Osborne Reynolds, and the criterion is known as the Reynolds number, which is the product of velocity, diameter, and density, divided by the absolute viscosity.

$$N_R = \frac{V\ D\ \rho}{\mu} \qquad (63)$$

For a circular duct, D is the diameter; for a rectangular duct, D is four times the hydraulic radius (which is the area divided by the perimeter of the duct). If the several factors are expressed in consistent units, this Reynolds number turns out to be a dimensionless characteristic of the flow. Accordingly, in whatever system of units we work, its values are identical; they are pure numbers.

For values of Reynolds number below 2000 the flow is likely to be laminar, for values above 3000 it is likely to be turbulent. Under special circumstances these boundaries may be far overrun; they merely express the results of most experimental studies, and may be regarded as indicating strong probabilities.

Consideration of the factors of the Reynolds number indicates the situation.

For flow through a pipe of given diameter, of a fluid of fixed density and viscosity, such as water or oil, the only variable is velocity. Low velocity, laminar flow; high velocity, turbulent flow. For water flowing through two pipes of different size, the boundary between laminar and turbulent flow will come at lower velocity in the larger pipe. For two pipes of the same size, the boundary will come at low velocity for water and at higher velocity for molasses (a liquid of high viscosity). For a third tube of the same diameter, the boundary for mercury will come at much lower velocity than for water, due to the high density of mercury (mercury at 150F has about the same viscosity as water at 50F). Examples might be multiplied indefinitely. All four items cooperate to locate the boundary.

Numerical values for air display the situation. The viscosity of air at room temperature in English gravitational units is about 0.375×10^{-6} pound (force) $\times$ sec/sq ft, and the density, again in gravitational units to maintain consistency, is $0.075/32.174 = 0.00233$ slugs/cu ft. Accordingly,

$$\text{Reynolds Number} = \frac{D\ V\ 0.00233 \times 10^6}{0.375}$$

$$= \text{approximately } 6210\ D\ V \qquad (63.1)$$

For the critical value of Reynolds Number = 2000,

$$D\ V = 2000/6210 = \text{approx. } 1/3 \qquad (63.2)$$

where the diameter is in feet and the velocity is in feet per *second*.

For velocity expressed in feet per *minute*, the relation is

$$D\ V = \text{approx. } 20 \qquad (63.3)$$

That is, if the product of diameter (feet) and velocity (fpm) is less than 20, the flow will probably be laminar; if the product is greater than 20, the flow will probably be turbulent. Since, in commercial ducts, the product of diameter and velocity is usually much larger than 20, we may safely assert that for our purposes the flow is always turbulent.

In a few special situations in commercial ducts we encounter laminar flow. Perhaps the commonest case is in cloth or paper air filters, through which the flow is at very low velocity and through very small passages. A typical velocity is 3 fpm over the face area of the cloth (of course it will be higher through the interstices). If the openings comprise as little as one-tenth the face area, the velocity in the openings will be only 30 fpm, and the limiting diameter will be such that

$$30\ D = 20 \text{ or } D = \tfrac{2}{3} \text{ foot} = 8 \text{ inches} \qquad (63.4)$$

In filter cloth or paper the passages are smaller than this. Accordingly, in filters of this type the flow is taken to be laminar.

Next month, Professor Berry will take up details of loss calculations in straight duct of uniform cross-section.

Plumbing Fixtures for Industrial Plants

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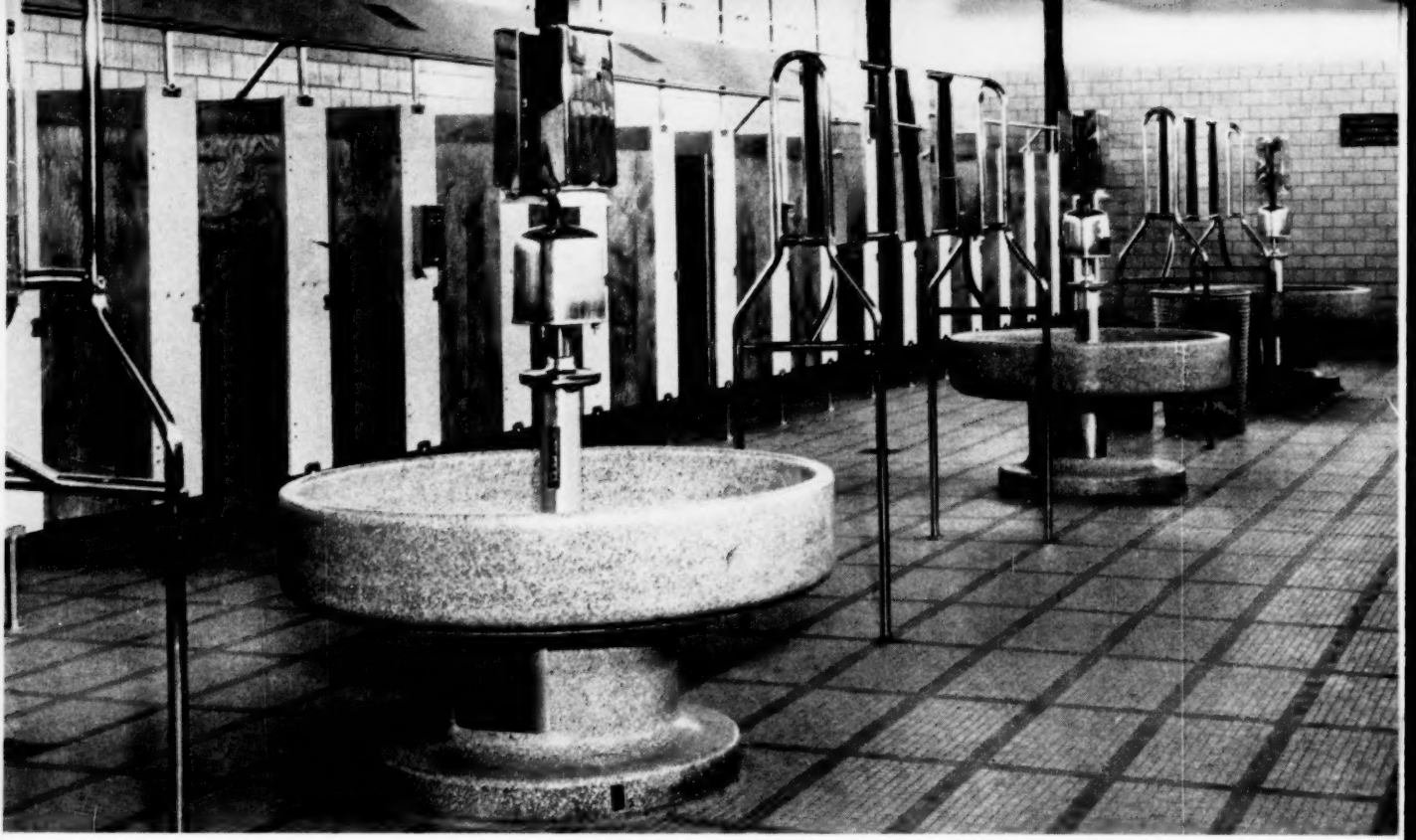

Plumbing Fixtures For Industrial Plants

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The many men and women employed in industrial plants, and the manufacturing processes involved, make it important that such buildings have properly planned plumbing facilities to serve wash room and sanitation needs. Not only does this article cover what is considered good design practice but it presents basic information regarding the plumbing fixtures that can be used in industrial plants.

CAREFUL planning is necessary to provide adequate wash room and toilet room facilities for an industrial plant. The design must not only meet minimum requirements of existing sanitary codes but it must consider flexibility of arrangement so that present facilities can be adapted to new requirements resulting from plant changes.

Best designs result when complete details are known such as the number of men and women to be employed, where equipment is to be placed and where the wash and toilet rooms are to be located. Where full details are not known, it is still possible to solve the design problem by planning for one or both of the two basic types of facilities identified as (1) centralized type and (2) dispersed type. After deciding which best serves the particular requirements, one can plan for present needs plus possible later readjustments.

Possible Arrangements

A centralized wash and toilet room area is satisfactory in small or moderate sized projects so that all employees or a large segment of the employees may be served conveniently.

In group (2) wash and toilet facilities provide for smaller numbers of employees at scattered locations.

Type (2) can also be used in combination with type (1) as frequently the smaller rooms are installed to serve individual groups of employees or as private facilities.

The choice of one or the other may be affected by size and nature of the project, installation economics, facilitation of care and supervision, and the availability of space. The latter item is gaged by the minimum requirements of codes regulating the location, the amount of facility required, and the floor spaces necessary for each unit of equipment.

These must also be supplemented by the following necessary considerations effecting location:

(1) Are hot and cold water and sewage services possible and practical to serve equipment in these locations at reasonable cost?

(2) Can ventilating requirements be met?

(3) Can proper privacy be effected?

If these items can be worked out satisfactorily, equipment locations and the use of any particular space can be selected later for the most feasable layout.

Location of Toilets

Specific locations of facilities, and whether wash rooms and toilet rooms should be centralized or decentralized, invariably depends on the size of facilities required and the type of building. Employees prefer facilities near their working place. In small industrial plants, washing facilities are usually near the entrances. Toilet room facilities, however, should be nearer to the work areas, preferably not more than 150 ft distant.

Exceptions to these requirements for wash rooms and toilet rooms are affected materially in industrial installations by the size of the plant, type of employees' work, nature of the industry for which the facility is to be provided, whether the plant buildings are isolated, and percentage of male or female facility required.

It is always advantageous, especially where women are employed, to centralize the toilet and wash room facilities, providing the size and type of plant buildings will permit. Experience indicates the need of a full time attendant for each room to maintain order and cleanliness, and to provide matron services for women who become ill at their work.

Available and accepted standards are helpful in determining the amount of space required in wash and toilet rooms. The minimum requirements are given in Table 1.

Single 36-inch and 54-inch diameter wash fountains should have a minimum of 2 ft clearance all around. Where the fountains are installed in batteries, a clear space between rims of the 54-inch fountains should be provided and a minimum of 2 ft between rims and wall lines.

Multi-stall type showers, where installed in circular arrangement and in batteries, should have a minimum space of 3 ft between the rims of receptor mouldings.

These minimum requirements are frequently increased to provide sufficient room to facilitate cleaning and maintenance-measures to prevent a health hazard. A center to center spacing for water closets, urinals, and lavatories of 36-inch, 28-inch, and 30-inch, respectively, will provide for their necessary cleaning. Where lavatories are not set flush with the wall, a space of 2 inches should be left between the fixture and the wall and 2 inches between lavatories.

TABLE 1—MINIMUM SPACE FOR WASH AND TOILET ROOMS

Fixture	Width, Inches	Depth, Feet	Floor Area, Sq Ft
Water closets	32	3.6	16
Lavatories	24	3.6	12
Urinals	24	3.6	12

TABLE 2—MINIMUM TOILET FACILITIES FOR MEN AND WOMEN

Number of Persons	Men		Women
	Closets	Urinals	Closets
	Number of Units Required		
1-9	1	0	1
10-24	2	1	2
25-49	2	2	3
50-100*	4	2	5
101-130	4	3	6
131-160	5	3	7
161-190	6	4	8
191-220	6	5	9

* Where urinals are provided for men, one closet less than the specified number of closets may be installed, except that the number of closets in such cases may not be reduced to less than two-thirds of the number specified. For women, allow one closet for each additional 30 persons above 100.

TABLE 3—MINIMUM NUMBER OF BASINS REQUIRED

No. of Persons	No. of Wash Basins
1-10	1
11-20	2
21-30	3
31-40	4
41-50	5
51-60	6
61-70	7
71-80	8
81-90	9
91-100	10

Water Closets and Urinals

The minimum number of water closets and urinals required and indicated in Table 2 conforms with standard code requirements of the United States Department of Labor, Division of Labor Standards, National Institute of Health, United States Public Health Service, and American Standards Association.

Lavatories and Wash Fountains

Requirements for lavatories depend on the number of people employed. Table 3 constitutes a reasonable basis in arriving at the minimum number of basins required. Above 100, add one wash basin for each additional 15 persons. For employees exposed to infections or irritating materials, where employees handle unwrapped food or where food products are manufactured, additional lavatories may be required by local code conditions. Lavatories, other than those provided for employees who

TABLE 4—NUMBER OF PERSONS SERVED BY CIRCULAR WASH FOUNTAINS

Number of Fountains	36" Semi-Circular	36" Circular	54" Semi-Circular	54" Circular
	Number of Persons Served by Each Unit			
	3	5	4	8
	Total Persons Served by Fountains Specified			
1	1-60	1-100	1-80	1-175
2	61-125	101-225	81-175	176-375
3	126-200	226-350	176-275	376-575
4	201-275	351-475	276-375	576-775
5	276-350	476-600	376-475	776-975
6	351-425	601-725	476-575	976-1,175
7	426-500	726-850	576-675	
8	501-575	851-975	676-775	
9	576-650	976-1,000	776-875	
10	651-725		876-975	
11	726-800		976-1,075	
12	801-875			
13	876-950			
14	951-1,025			

handle food or are engaged in the manufacture of food should not be located in the work area.

When rectangular wash troughs are considered (not recommended by the writer), a standard that is recognized by the United States Public Health Service, and the American Standards Association, indicates that for use, 24 inches of trough with faucet is equivalent to one lavatory. A specific adherence to the directives of local code requirements is suggested. Individual type lavatories are usually preferred (1) where the work is clean and light, (2) where the wash and toilet rooms are of the decentralized type, and (3) the number of employees are few.

For washing facilities in the large or moderately large industrial type buildings, there is a preference for the trough types for both sanitary reasons and convenience. These types are available in rectangular and circular patterns. Table 4 for circular wash fountains, subject to modifications to conform with local code requirements, is commonly used.

Other authorities such as *Mill and Factory* suggest that a greater number of fixtures be provided for a lesser number of people. It is imperative, however, that the minimum number of fixtures be consistant with the requirements of local governing codes.

Showers

Shower facilities are also an important requirement for some industrial buildings such as foundries and the like. By no means are shower requirements confined to employees of this type of industry. Experience has shown that in foundries 85% of the employees use showers daily and only 5% leave the plant without using any washing facility provided.

Shower installations generally consist of two types, the gang shower and the stall shower. The large gang type without partitions eliminates privacy. The multi-stall and stall type showers provide a moderate amount of privacy within compartments. Only when the single cabinet type or built-up shower compartments are set in conjunction with adjacent dressing rooms is it possible to achieve privacy.

Where showers are provided for women employees, greater privacy is desirable than that supplied for men.

Regardless of the type of facility for showers, it is imperative that there be proper floor construction to assure suitable draining and flushing to keep the floor of shower and wash room clean and dry. This promotes good sanitation.

Drinking Water

Provisions for drinking water can be varied and usually are: However, depending on the conditions and economics, this provision may run from large central refrigerated circulating systems to the bottle dispensing unit.

There are numerous types of self-contained electric water coolers available, also, to serve for spot location requirements. Drinking water should have a temperature not lower than 40F and not higher than 80F with a preferable range of 45 to 50F.

Where drinking water coolers, dispensers or fountains are installed according to accepted standards of the United States Department of Labor, National Institute of Health, and U. S. Public Health Service, one such unit should be supplied for each 50 persons that are employed in the plant.

Drinking Water Consumption

Drinking water consumption is subject to extreme variations depending upon the location and the class of building involved. The capacity of water cooling equipment should be based on the consumption for the specific conditions. For industrial type installations, Table 5 is a practical guide.

TABLE 5—WATER CONSUMPTION PER PERSON IN INDUSTRY

Type Service	Gallons per Hour per Person	
	North	South
Industrial, heavy service	0.06	0.10
Industrial, light service	0.20	0.25

The line of demarcation between the North and South is generally defined as 40 deg North latitude.

These comments will constitute a skeleton on which to build a clearer understanding by pointing out some of the characteristics of fixtures and accessories of types generally associated with industrial sanitation requirements. A limited attempt will be made to cover some of the specific technical information for each separate type of fixture under the heading "Description of Plumbing Fixtures."

Description of Plumbing Fixtures

This description of plumbing fixtures, confined primarily to the types usually required and adaptable for the needs of industrial projects, by no means covers the range of the many fixtures available. There are many fixtures for special needs.

The ranges of fixture types manufactured, sanitary and durable materials and finishes, and high standards are condensed to indicate the fixtures generally acceptable

as well as being practical for use on industrial installations only.

Plumbing fixtures come in so many patterns and finishes and special characteristics, that even to generalize would require an exhaustive description. However, the following groups of fittings should be included:

(1) Bath and shower fittings.
(2) Lavatory fittings including wash fountains.
(3) Water closet and urinal fittings.
(4) Sink fittings.
(5) Drinking fountain fittings.

Fittings for these fixtures can be modified to spread over numerous combinations with trade identification labels and with features ranging from individual to specific application and purpose, as for example in the case of bath and shower fittings. Here the combinations range over the following.

(1) Four-valve combinations.
(2) Mixing valve combinations.
(3) Diverter combinations.
(4) Body spray combinations.
(5) Transfer valve combinations.
(6) Four-valve cluster.
(7) Unit with pop-up waste and chain.
(8) Unit with rubber stopper chain.

In respect to these various applicable combinations, the types of valves, shower heads and style are items that must also be considered for each type of fixture in much the same manner as above described for bath and shower fittings generally.

For convenient listings of the voluminous types of fixtures, fittings and drain combinations, the manufacturer's complete catalogs should be consulted. It is designed to simplify equipment selection.

To continue with the requirements and descriptions of plumbing fixtures for industrial use, let us proceed by listing the types of plumbing fixtures to be described.

To this end, for clarity and composition, let us conclude that all subject matter associated with the various types and kinds of fixtures will be simplified by fully describing the characteristics of the fixture, its basic requirements, and adding comments as to its type and use.

Types of plumbing fixtures confined to industrial project uses will be described in the following order: Water closets, urinals, lavatories, wash sinks, wash fountains, showers, service sinks, drinking fountains, drinking water coolers, materials (fixtures), and rate of discharge for plumbing fixtures.

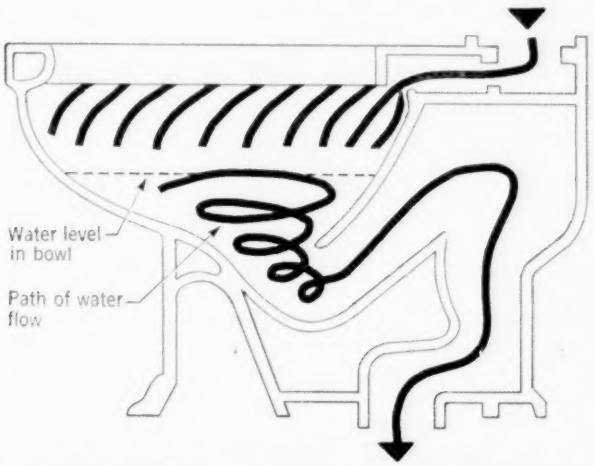


Fig. 1. Water flow through a siphon vortex fixture.

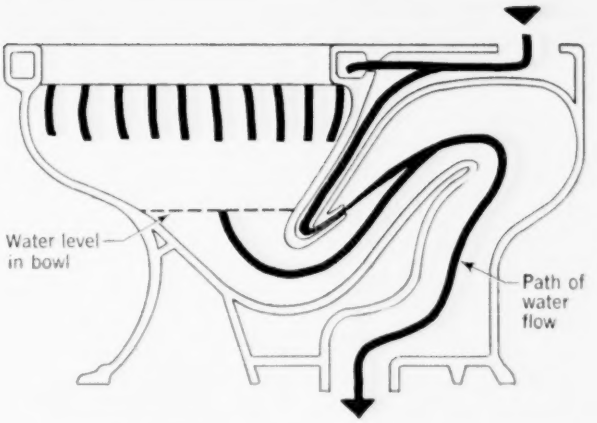


Fig. 2. Section and water flow of a siphon jet.

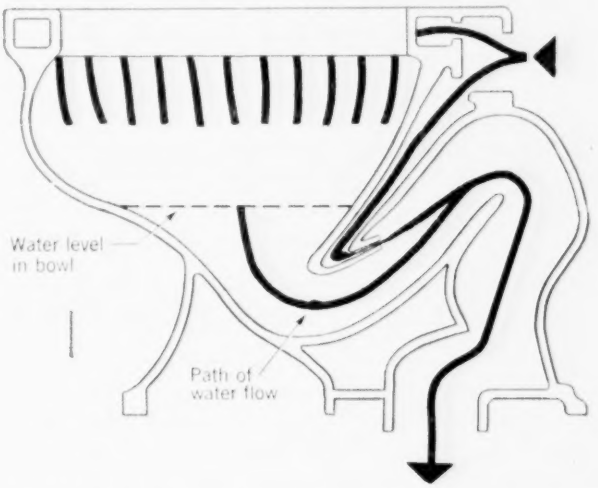


Fig. 3. Section and water flow of a siphon, reverse trap with jet.

Water Closets

Water closets, always made of vitreous china, are generally confined to two types, wall outlet and floor outlets —with specific action that can be characterized as: siphon vortex, siphon jet, siphon reverse trap with jet, siphon washdown with jet, and blowout.

Siphon Vortex. This is the latest in bowl development. The design of the closet, Fig. 1, permits water to enter through diagonal punchings around the circumference of the rim to create centripetal action forming a vortex in the center of the bowl which draws contents into the well of the bowl. The swirling action cleans the bowl; as the water strikes two parallel ridges in the bowl it is folded over forming a jet of water directed toward the outlet producing siphonic action which causes expulsion of the contents.

Siphon Jet. The design of this type closet, Fig. 2, permits water to enter through the rim and jets placed in

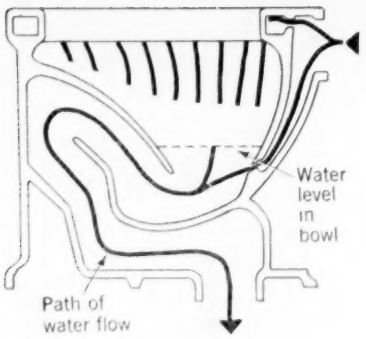


Fig. 4. Section and water flow of a siphon, washdown with jet.

the up-leg of trap thereby filling the trapway and creating siphonic action. The result is a quick withdrawal of water from the bowl preventing objectionable rise of water.

The location of the jets makes the closet self-draining. Removal of the visible water will prevent freezing in an unheated building during cold periods.

Siphon, Reverse Trap With Jet. The design is the same as in the siphon jet with the exception that the closet is smaller. (See Fig. 3).

Siphon, Washdown With Jet. The design of this closet, Fig. 4, permits water to enter from rim and the exposed self-draining jet fills the bowl until enough head is formed for flushing. As flushing action begins, the rear column of the trap acts as a siphon and empties the bowl. The jet diverts a portion of flushing water directly to the trap creating a faster and quieter action. This closet differs from the siphon jet and siphon reverse trap closets in that the trap way is in the front instead of the rear of the bowl.

Blowout. In the design of the blowout closet, Fig. 5, water enters from the rim and a very strong flushing action is created by a jet of water directed into up-leg of outlet passage.

The force of this jet draws the contents of the bowl into the up-leg, forces content into down-leg and into the soil pipe which, in the case of wall-hung closets, acts as the down-leg of the closet.

Variations in Operation

The differences in operation of the bowls described should be clearly understood, particularly by architects and specifications writers.

Washdown type bowl is the most economical pricewise, but cannot compare in sanitary features with the other types. Siphonic action in closet bowls was originally developed in the washdown and this was recognized as a great improvement over all former types of closets. However, the demand for larger bowls having additional water area with less fouling surface brought about a complete change in bowl design. By reversing the trapway and putting it in the back of the bowl, the bulge at the front of the bowl was eliminated and this provided greater water area in the front of the bowl with a corresponding reduction in the dry soiling area in the front. This change created the reverse trap closet. The earliest of the reverse trap closet bowls did not have a jet. It depended upon rim flushing and operated very similarly to the early washdown type closet.

Reverse trap bowl with jet, Fig. 3, is sometimes confused with the siphon jet, and the difference is primarily one of overall size and diameter of waterways.

Siphon jet bowl, Fig. 2, operation is due to siphon action in the trap. A jet at the bottom furnishes the initial push at a flow rate of approximately 30 gpm and at a pressure of approximately 10 psi minimum. This type bowl is the most expensive but smoothest in action and is quiet in operation.

Siphon vortex bowl, a noise-reducing design, works on the siphon principal, but water is directed into it in such a way that centripetal action is generated. This makes a very powerful siphon-operated bowl, but has the advantage of reducing noise.

Blowout water closets do not necessarily operate on the siphon principal but depend on the operation of the volume of water at a direct pressure of generally 25 psi or more.

While a jet is included in the bowl, it only increases the efficiency of the bowl, which is actually operated by having the contents blown out of the fixture, hence its name. This type fixture which is frequently used in industrial installations, has a simple trapway, smooth discharge outlet, discharges at a rate of approximately 36 gpm, is less expensive, is easy to maintain but it is noisy. This unit is always equipped with a flush valve as it is impractical to flush by tank because of the discharge pressure required.

Wash down bowls function by creating sufficient head of water in the bowl to flush. As flushing starts, the rear column of the trap acts as a siphon discharging the contents of the bowl.

The action is simple but not positive and frequently requires additional flushing to discharge contents of bowls. It is definitely not a water saver and pressure of the water supply has no influence of the flushing action except that the time required for filling of the bowl to flushing level is shortened. However, it is the least expensive bowl and is designed mainly for residential installations. The economic factor relating to initial installations costs frequently prompts the installation of this type closet in certain industrial projects where the specific requirements are of a minimum character. For sanitary conditions and water conservation, installation of this type fixture definitely should be avoided except for residences or for conditions similar to residential use.

Features for Industrial Closets

Water closets for industrial use should have the following features:

(1) Large water area to prevent fouling of the interior.
(2) Strength of flush that will completely expel the contents of the bowl in one operation.
(3) Ample clearance in front to avoid personal contact.
(4) Economy of operation.
(5) Sturdy construction to withstand rough usage.

Fixtures for industrial installations, therefore, should be confined to elongated types, blowout or siphon jet, either wall hung or floor outlet types. All closet bowls should be designed to avoid back siphonage or the water inlet should be provided with a vacuum breaker. The vacuum breaker should be installed between the flush valve and bowl for positive protection against siphonage.

The flow rates for water closets varies. For washdown types, the rate of flow is approximately 24 to 36 gpm. A mean average would be 30 gpm.

The quantity of water required depends on the duration of flush. A quantity in excess of 5 gal and a mean gallon per minute rate in excess of 36 gpm, conforming with Recommended Minimum Requirements for Plumbing, U. S. Department of Commerce (Elimination of Waste Series, Bureau of Standards, BH-13), constitutes a waste of water.

Regular base and *wall hanging* types of closets are more suitable for industrial installations and are recommended for conditions where large water capacity and sanitation are must factors, and for special fixture construction as required for women's toilet rooms, where quiet operation is essential and where direct pressure flushing application is used.

Where a bottom outlet through the floor is prohibited due to building construction conditions, the *angle back and base* types with back outlets are also available and practical.

These type fixtures are primarily for use with flush valves which can be arranged exposed, or concealed for push button, foot pedal or oscillating handle operation.

All types of wall hung installations require wall or chair carriers designed to give rigid structural support. These supports consist of adjustable types-horizontal, integral types-vertical, integral type-unit, etc. Supporting chairs for hub and spigot soil pipe and lead or iron pipe installations are available to meet problems for particular conditions.

Facilities for Men

Urinal fixtures for men are usually confined to three basic types, namely pedestal (floor outlet), stall (floor outlet), and wall hung (wall outlet).

There is always considerable difference of opinion as to the most efficient urinal to be recommended although at present the trend is toward the blowout wall hung or the pedestal type siphon jet.

Pedestal Type. These units are free standing, somewhat cumbersome, and require greater floor space. They are designed for use in installations where a large outlet and flush are required to assure that refuse such as cigar ends and the like will be discharged in a single flush. This type fixture is constructed similar to the water closet and is installed on a 4-inch closet flange. Also similar to the water closet, it has a flushing rim encircling the top which provides a water action which scours the fixture walls thoroughly. It has an extended flared back lip which prevents the soiling of floor and clothing. This type fixture may be installed singly or in batteries, for application where there are top spuds on units for flush tanks, where exposed flush valves are used for foot pedal control, and or with back spud where concealed flush valves are desired. The pedestal type is exceptionally suitable for installation in public wash rooms, comfort stations, and in special locations where conditions as described are essential because of their exceptional sanitary qualities. One exception to this, however, is that the floor back of the urinal is difficult to keep clean. This fixture naturally increases the initial installation cost somewhat and requires a water seal similar to a water closet. In tank flush installations, not more than one urinal of this type should be supplied with water from a simple tank.

Stall Type, Floor Outlet. These are popular because of their adaptability to most construction conditions. The design permits setting the fixture back into the wall with lip flush with floor in single or in battery arrangement spaced center to center remote (several inches space between units), or in close battery installations with a rounded cover or bead over the seam for streamline effect. Spacing of fixture when seam covers are used shall be standardized. This type unit is designed with an internal spreader which disperses the flush to the side and back walls of the fixture to assure a complete wash down of the walls with a minimum amount of water. It is similar to the pedestal only in that top or back spuds for tank, exposed valve, concealed valves or floor foot valves can be installed as conditions dictate. Four such fixtures can be flushed from a single tank where flush tanks are considered.

Wall Hung (Blowout and Washdown). Several types of these wall hung urinals equipped for flushing variations, as described for stall and pedestal designs, are available for all general requirements in blowout and washdown actions types. The *blowout wall hung type* urinal, designed for flush valves only, with extended shields, integral flush spreader, strainer and trap, is both popular and practical. It lends itself favorably to the architectural treatment of modern wash rooms and gives a maximum degree of sanitation because it clears the floor for easy cleaning. The height from the floor can be varied but usually the top of the fixture is set 46 inches above the floor. The flushing spreader at the top also assures complete washdown of walls. This urinal requires the use of an approved type wall bracket or chair carrier. Chair consists of steel plates secured to adjustable cast iron pipe sleeves, steel pipe uprights and alignment trusses, including adjustable holes, threaded bolts, nuts and chromium cap nuts and washers.

The wall hung *wash down* urinal is designed for use with flush valve or flush tank supply and is similar in appearance to the wall hung blowout type in that it is wall hung, has extended shields and integral flush spreader. Except for this resemblance its function is quite different.

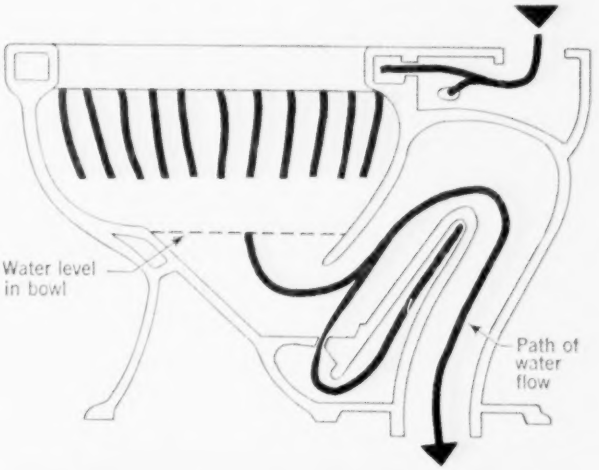


Fig. 5. Section of a blowout closet and path of water flow.

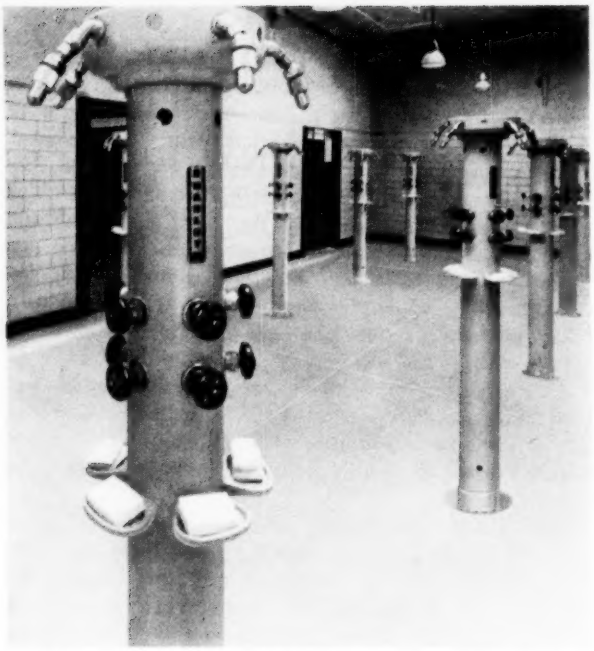


Fig. 6. Showers installed in the washroom of a chemical plant.

This urinal is not recommended for installation in an industrial type building for it is expensive to maintain. The china guard over the outlet does not permit chewing gum, gum wrapping papers, match sticks, cigarettes and the like, which is thrown into the fixture, to be discharged from the fixture. As a result, frequent servicing is required to maintain cleanliness.

Wall-hung type urinals offer some advantages such as less surface to keep clean. Conversion from men's to women's rooms can be made easily by removing and replacing urinals with lavatories or boxing them in without the necessity of cutting floors.

Facilities for Women

At the present time, women's urinals are not generally used in commercial building but their use is growing in industrial building. It is not inconceivable that within the next few years, women's toilets will be considered antiquated if they do not have this type fixture.

The reason that such great interest is developing in this unit is that when a building has separate facilities for men and women, an impartial investigation will always show that women's toilet rooms are far more unsanitary than the men's rooms. It is remarkable that greater clamor has not been raised by women for better sanitary conditions. Most women are reluctant to come into physical contact with the fixtures provided in toilet rooms. Misuse often results, and rooms become unpleasant, unsanitary, and maintenance costs rise for such rooms.

These urinals, made of vitreous china, are designed to give the maximum possible sanitary conveniences. It has siphon vortex flushing action with jet, which will expel the bowl contents quickly and quietly with each flushing.

These fixtures are available for floor or wall outlet and with various flushing arrangements.

Lavatories

Lavatories may be made of either enameled cast iron or vitreous china. The most sanitary material that has yet been devised is vitreous china. It has a hard surface and is non-absorbent throughout. If it is chipped by a hard blow the damage does not penetrate through the base. The glazed surface is so hard that commercial cleaning preparations do not affect it. Cast iron enamel ware is essentially nothing more than a casting which is fired to a cherry red and a dry silicate sifted on it. The dry silicate, which is finer than the finest face powder or flour, melts when it comes in contact with the heated body and when the casting cools, it is then found to be covered with a glass-like body or enamel. This finish comes in regular enamel or acid resisting enamel. Acid resisting enamel is not acid-proof but it resists any acid commonly found in the bathroom or in the average building.

Support for Lavatories

Lavatories should be substantially wall supported. Legs, supplies and trap to the floor impede the cleaning operation and, therefore, increase the expense or decrease the ability of the cleaner to do a good job. Fixtures are supported on the wall by various means, but the following two methods are suggested.

(1) Lavatories with backs should have a cast iron bracket firmly bolted to the wall with through wall bolts and fastened on the reverse side of wall to fish plates with nuts.

(2) Lavatories without backs should be supported on either a suitable wall carrier or a suitable chair carrier.

The wall hung lavatory, with or without back, is recom-

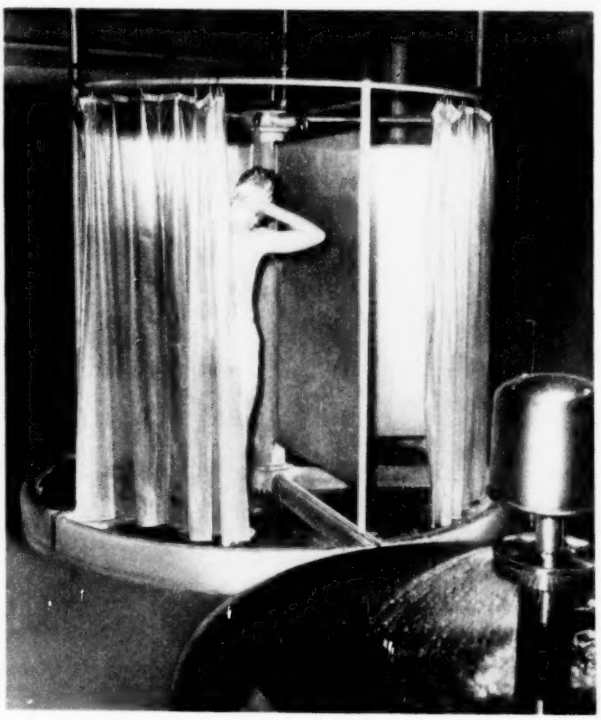


Fig. 7. Multi-stall shower and wash fountain provide a compact installation.

mended, and the size, in china, will generally be 20 x 18 inches and 24 x 20 inches. In enamel, the size will generally be 19 x 17 inches and 22 x 19 inches with back; without back, 24 x 20 inches.

Lavatory Trim

These lavatories may be trimmed in various ways:

(1) A pair of compression faucets with a chain and plug or a pop-up waste. This does not permit tempered water, except by filling the bowl which is generally unsanitary.

(2) Self-closing faucets with a chain and plug or pop-up waste. There are various types of self-closing faucets, including the slow-closing, self-closing type. General use of the self-closing fittings is on the wane, for employees invariably will arrange various contraptions to keep the cold water faucet, in particular, running. Many people report that self-closing, slow-closing action is too delicate and creates maintenance problems because grains of dirt and sand in the water can change the setting and the actual flow of water at the fixture.

(3) Combination fittings, such as the so-called "close coupled" fittings. This is generally a compression type valve with either chain or pop-up waste, or a combination fitting with a wider spread having a center spout and with a chain and plug or pop-up waste.

One of the latest developments, and considered by many to be the finest, is a combination fitting, usually center set with a spray on the center spout, with an open waste strainer. This permits the user to wash in running water with a minimum amount of water consumption. Such a fitting does not permit the bowl of the fixture to be filled. Under certain conditions filling the bowl may be most unsanitary. The perforated grid does not permit rings, jewelry or other items to fall into the waste trap. Most combination fittings may now be obtained with an aerator which mixes air with the water, often eliminates considerable objectionable odors from the water, increases the suds action of soaps, and prevents splashing.

Lavatory waste fittings may be had with an open waste strainer, chain and rubber stopper, or pop-up waste.

Wash Sinks and Fountains

Wash sinks are available coated on the inside with cast iron acid resisting or regular enamel, with backs or without, for wall mounting or free standing on pedestals. They are practical and suitable for use in industrial plant wash rooms.

These can be procured in 4, 5, 6, and 8 ft lengths, 18-inch and 22-inch widths, with 8-inch and 10-inch backs, respectively, and in 30-inch widths for free standing pedestal supports.

Two single or double faucets and one soap dish usually are provided for the 4 ft length units; two for the 5 and 6 ft lengths. The 4, 5 and 6 ft lengths are usually 18 or 22 inches wide with 8-inch backs. Four double faucet gooseneck spout sprays with removable faces, and 3 soap dishes, usually are provided for the 8 ft length that is 22 inches wide and has a 10-inch back. For the units 30 inches wide by 4, 5, 6 and 8 ft long, free standing, pedestal supported wash sinks, the trim usually includes 4 faucets and 4 soap dishes for the 4 ft long sink; 6 faucets and 6 soap dishes for the 5 ft and 6 ft long sinks, and 8 soap dishes and 8 faucets for those 8 ft long.

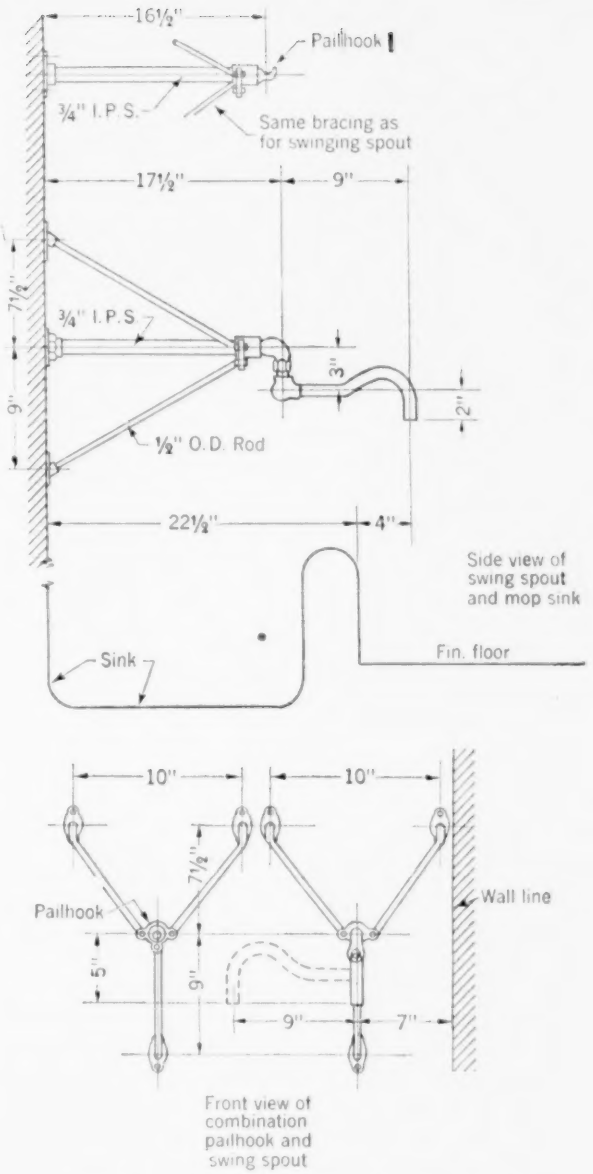


Fig. 8. Details of a swing spout and mop sink.

TABLE 6—SPACE ALLOWANCES FOR LAVATORIES

Lavatory Size, Inches	Length of Battery, Inches		Width of Battery, Inches	
	3 Lavatories	Each Added Section	Single	Double
		Vitreous China		
20 x 18	74½	24	20	38
24 x 20	86½	28	22	42
		Cast Iron		
24 x 20	86½	28	23½	44⅜

Fig. 9. Conveniently placed wash sinks promote sanitation.

A double faucet spray with removable faces usually comes with 30-inch sinks.

These type sinks can be arranged in multiple groups to provide for specific demand requirements or installed as single fixture installations in several remote locations, as necessary.

For industrial plant group washroom facilities, the washing fountains such as the Bradley type is superior.

In lieu of wash fountains and wall sinks for group washing, lavatories can be arranged in units in proportion to demand conditions.

Lavatory Types Available

Lavatories for this type of installation can be procured of vitreous china or cast iron, with or without backs, depending on the type and size. They can be installed as single units or in batteries, equipped for wall mounting on wall brackets, wall plates or chair carriers, as desired, or may be installed in batteries free standing on floor standards designed for single or double section batteries. Where the latter method of installation is desired, the sections are usually as listed in Table 6.

As all lavatories must be individually equipped with separate roughing trim, one can easily understand why the wash fountain is by far the more practical, efficient and economical.

Several types of group washing fixtures designed to meet every requirement are available to supplement the need for group washing facilities where many persons are employed, as is usually the case in industrial plants.

Installation of this type of equipment assures a clean, sanitary and efficient washroom at a low installation and maintenance cost, and conserves valuable time, space and water. It is available in stone and color combinations, in stainless steel and enameled iron of varied sizes, in circular and semi-circular types, and for hand or foot controlled operation. All these styles contribute to an attractive and convenient washroom as well as one of modern appearance.

Showers, Cabinets, Receptors and Multi-Stall

Numerous types and variations of installations for providing shower facilities are made available by reliable manufactures to suit specific and special requirements.

Shower receptors come in various sizes and shapes: materials are suitable and adaptable to conditions for in-built showers and cabinet showers; materials are suitable for individual or battery installations as well as for multi-stall shower types.

As indicated for wash fountains, the multi-stall shower arrangement, with or without receptors, is the most satisfactory for industrial plant requirements. The multi-stall shower, like the group wash fountain, assures clean sanitary conditions, a maximum efficiency in less floor area, costs less to install and maintain, conserves water, requires less material and reduces heating and power costs.

Service Sinks

Service sinks, with or without backs and with or without flushing rims for use in commercial and industrial applications, can be procured in several sizes in vitreous china, and with an inside surface of cast iron-acid resisting or regular enamel.

These fixtures normally have 3-inch outlets, threaded, but can be furnished with 2-inch outlets when specified. They come with enameled inside adjustable trap standard, and floor flanges for through floor installations.

Trim for these fixtures can be secured for service connections through back, with wall supplies, bucket hook and top brace, and where flushing rim sinks with flush valves are to be provided, bucket hooks with forked brace can be supplied.

Where mop trucks are to be used for cleaning, floor

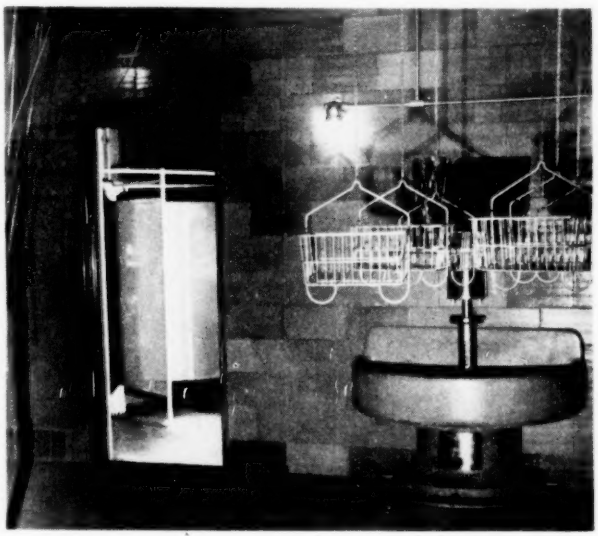


Fig. 10. Washroom facilities installed in a steel company plant.

washing floor type sinks are usually provided in the janitor's service closet for emptying mop trucks. There are special provisions for filling the trucks. One method is shown in Fig. 8. It is necessary to have the dimensions shown in the front view of the swinging spout so that the stream from the spout will strike inside of mop sink basin when the spout is turned to the left as indicated by dotted lines.

Drinking Fountains

Various types of drinking fountains are used. Basic type fixtures for this purpose are face mounted, semi-recessed, recessed, battery and pedestal types.

Regardless of the fixture used, the following features should be included: A practical automatic stream control device to maintain a constant height in the drinking water stream regardless of the supply line pressure variation; a drinking mound must be formed to effect localization of the drinking point.

With these provisions included, the installation prevents the necessity of making finger and lip contact with the source of supply, and the possibility of squirting water is eliminated.

Where one desires to maintain a constant flow of water, a bypass valve can be installed which will permit a small stream of water to flow continuously and a full stream when the self-closing stop is operated.

To effect these required sanitary items each fixture should be provided with a guarded angle stream nozzle head, a self-closing valve, an automatic volume regulator and regulating stop.

The nozzle head should be adjusted to produce a jet at an angle that water will not fall back onto the jet orifice. The head should be suitable for direct drinking and not less than $^3/_4$-inch above overflow point of the bowl rim. The guard should be properly proportioned in relation to the nozzle to discourage personal contact with the source of supply.

Drinking water consumption varies with the class of installation and the amount of water required is seldom known. For industrial installations, and where the maximum population of the specific project is available, the demand can be safely estimated on the basis of 1/5 to $^1/_4$ gallon per hour per person.

Drinking Water Coolers

Self-contained mechanically refrigerated electric water coolers are a practical, convenient and sanitary method for providing drinking water economically. They can be procured in many types and styles to suit nearly every desire and include:

(1) Bottle type
(2) Compartment type
(3) Air-cooled pressure type
(4) Water-cooled pressure type
(5) Water-cooled pressure explosion proof type

Self-contained mechanically refrigerated drinking water coolers for foot pedal or hand control can be furnished for drinking water stations in proportion to the equivalent number of drinking fountains, depending upon the requirement.

For industrial installations the foot pedal control is recommended because of convenience. With both hands occupied, as is frequently the case, the step pedal is easy to operate to obtain a drink.

The writer also recommends that coolers equipped with capillary tube in lieu of expansion valves be installed to avoid maintenance and repair bills. Such charges are always greater when moving parts are involved. In short, install the hermetically sealed system types, when possible, for long service at minimum maintenance cost and avoid the so called open type system coolers.

TABLE 7—RATES OF DISCHARGE FROM PLUMBING FIXTURES

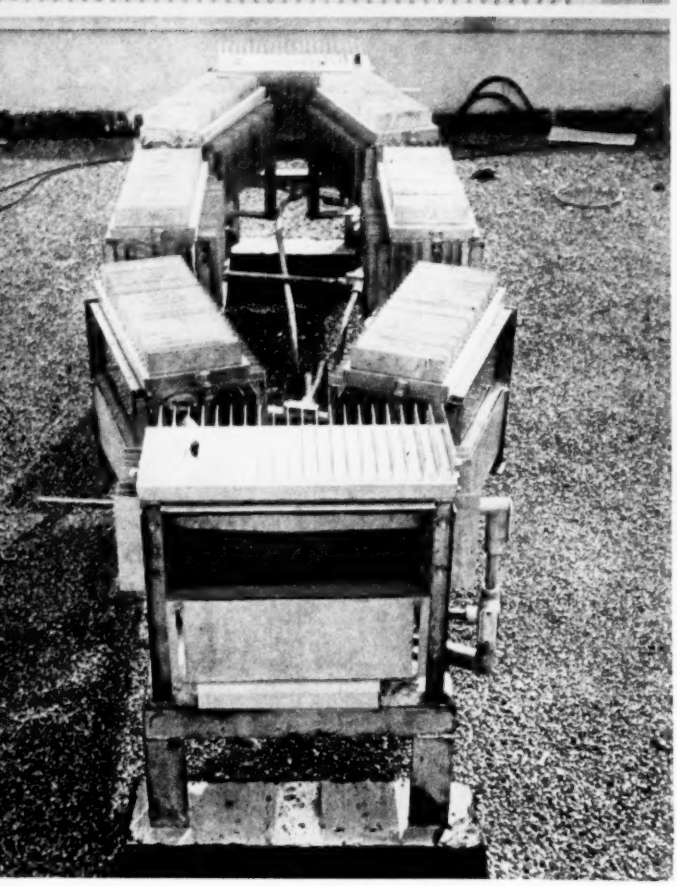
Fixture	Flow, GPM
Water closets	
Wash down closet	27 to 33
Siphon jet closet	30
Urinals	
Wall—blowout	24
Wall—washout	20
Stall	15
Pedestal	45
Lavatories—1¼-inch outlet	7.5
Sinks—1½-inch outlet	11.3
Service sinks—3-inch outlet	12
Shower heads	
Single—4-inch size, ½-inch inlet	6
Single—6-inch size, ½-inch inlet	12
Wash fountains	
36-inch circular	5
36-inch semi-circular	5
54-inch circular	7.9
54-inch semi-circular	5
Showers	
Circular—5 compartment—per shower head	3-4
Semi-circular—3 compartment—per shower head	3-4

Fixture Material

Vitreous china is very often confused with porcelain or so-called semi-vitreous china. Porcelain actually is fire clay that is molded and glazed and then fired, but it is not fired at the same heat as vitreous china. Porcelain and semi-vitreous ware have a comparatively soft and porous body underneath the glaze and with the differences in coefficients of expansion and contraction, develop craze lines which permit moisture to get in to the soft porous body underneath.

Vitreous china, on the other hand, is a mixture of feldspar, flint, and various china clays that are mixed and molded and then fired. Before firing, the formed product is called green ware; after the first firing, it is spoken of as bisque. When the bisque is dipped into the glaze or has glaze applied to it, it is re-fired and the fixture is then found to be a vitrified, homogeneous body. The ideal method is to make the vitreous body with a good glaze in one firing.

While special plumbing fixtures have been produced for particular industries, the units described have general application in industrial plants.



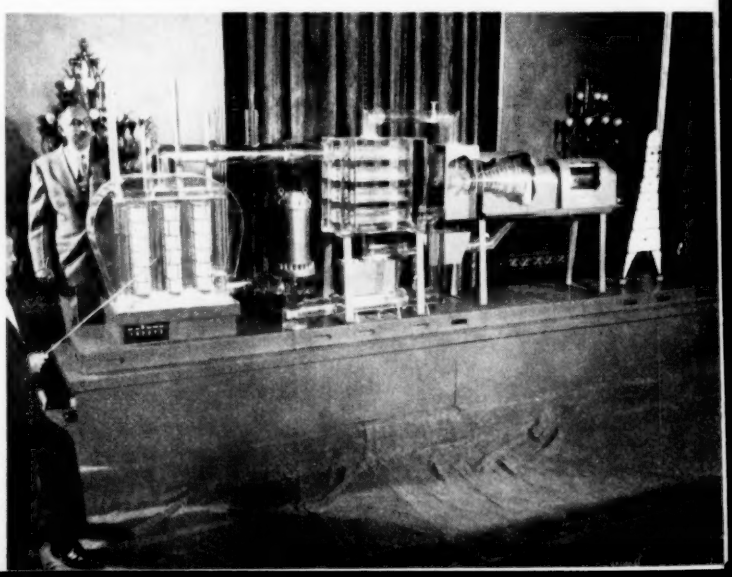
(Above) The sun's energy controls the air conditioning system in Los Angeles' 1,275-room Statler Hotel. Here, on the hotel roof, is the heart of this control system developed by Minneapolis-Honeywell Regulator Co.; eight electronic compensators. A room-angle glass in each shelter receives the sun's rays while black, pumice-like material retains the heat. In each shelter an electronic thermometer measures the sun's penetration. An outside electronic thermometer measures shade temperature and anticipates air temperature changes as they will later affect room comfort. Signals fed into the system proportion the temperatures.

(Above) All-year zoned air conditioning, with virtually no visible equipment or loss of space, has been achieved by the Prudential Savings Bank, Brooklyn, N. Y., through the use of 17 room unit air conditioners. The system utilizes United States Air Conditioning Corporation Modu-aire units recessed into the outer walls on the main floor and mezzanine. The unit panels were removed and enclosed in marble with bronze grille fronts. Fresh air is supplied through two 750 cfm units in the rear building wall so that there is no visible entrance of the system from the exterior, either. Business was maintained as usual during the entire operation.

Picture Paragraphs

(Below) Rigid control of atmospheric conditions is maintained in this 250,000 square foot Northrop Aircraft Plant at Anaheim, Calif., with the use of Western rotary ventilators and curb mounted fans. T41 optical range finders for the Army's M47 Tank are made here. Twelve hundred persons are employed, and in the 30,000 square foot assembly department, temperature and humidity are kept at the optimum range with the ventilating system which at peak operation can exhaust 18 million fph of air.

(Below) This plastic model of an atomic power plant was built by Westinghouse Electric Corporation's Atomic Power Division for studying simulated nuclear reactors. The atomic pile generates heat through nuclear fission. To keep the pile cool, a suitable heat transfer liquid is pumped through the reactor to the boiler or heat exchanger and back. Heat from the coolant is transferred to water in the boiler and steam results, which drives turbine-generator at the right.



What's New That's Unusual

T. W. REYNOLDS

Looking back on trends new or unusual that have been announced during the past few years. Presented are items of interest relating to bathroom, and to drafting room and field practices.

ALTHOUGH leaves may blow into an outdoor swimming pool, and its chlorine and water may evaporate, a plastic cover resting on the water will avoid such nuisances. One indoor swimming pool has instituted a variable use-charge. The fee goes up with the temperature, thus keeping the pool from being over crowded.

The flush sprinkler head is in demand and there is one designed so the mechanism drops when in use to give improved water distribution. There is also a long tool which acts as a stopper to a sprinkler head after a fire is out, or when a head goes off when it should not. The tool is left hanging on such a head to direct attention to its closed position.

The hot water heater, if electric, can have a three-way adjustable element to provide 50, 60, or 80 gals. of hot water as desired when company comes or the family increases. For restaurants, auto laundries, hospitals and hotels there is a hot water heater that can have twin coils to avoid the use of a separate storage tank, yet have water supplied at two temperatures.

In the industrial plant an electric hand dryer in washrooms will dry hands in 20 seconds and with good sanitation. There are also water coolers, solenoid valves, and other electrical equipment to remove the explosion hazard. Someone has even produced a powder to be blown into inaccessible areas where it will volatize and give off vapors to prevent rust.

Drafting Room

For the drafting room there are many innovations and conveniences—all sorts of slide rules and calculators which select the radiator, reducing valve, register or air diffuser and leave you but little to think about. Then, too, there are plastic sheets with scales for perspective drawing and a portable light weight plastic drawing board about 10 x 12 inches in size for carrying in one brief case. This board is complete with horizontal and vertical straight edges, corner clamps that do away with thumb tacks, and triangles that are placed in a recess under the board. Drafting instruments have also gone into combinations such as one combining a T-square with a straight edge, triangle, protractor and scale, while the simple eraser has gone from hand power to electric power. This last step has taken a long time. It was over 40 years ago in the General Electric Company at Schenectady and the Grand Central Terminal in New York that we thought them out and made them up ourselves from a fractional horsepower motor, flexible cable and a little of this or that.

But shortly after the drawings are finished they get in the way of new work, get shoved around and take on a second hand look. However, an aersol plastic spray can be used to protect blue prints, drawings, photos and important papers against smudge, finger prints, dust, light and humidity. There is also a plan for building aluminum tubes 30 to 36 inches long into the building wall. Tubes are insect proof.

There are all kinds of scales, but one may be mentioned, because it is of rubber and is made somewhat like a slide rule to scale a published drawing. It has a number of other uses. Of course, some one would think out a steel rule for use in the dark. After taking a measurement, one just locks a lever to hold the measurement until he reaches a light.

Measuring tapes have many ramifications from those that glow in the dark to tapes that can be extended rigidly overhead for 10 ft without buckling. One tape Fig. 1 rolls along on a wheel of 2 ft circumference and measures as you guide it while walking and estimating. It can travel horizontally and vertically, take curves and follow contours. The tape is recessed on a wheel about 8 inches in diameter and there is a click every 2 ft and a bell tone at 100 ft after which the cycle is repeated.

For technical lectures there is now a blacklight fluorescent chalk that saves the usual delay and makes it possible to use the blackboard while showing slides. Paint also comes into the picture for there is a paint, which can so change a surface of materials such as masonite, plywood or metal, that it can be written on with chalk. The paint is green and has no glare.

Out in the Field

When the engineer goes out in the field for a check up and adjustment of this or that he can make good use of a flashlight with a lens that will magnify his troubles, or a flashlight that is part of a screw driver. He will drop things while at his investigations, but for very

Linear distance obtained by pushing wheel.

small things that always lodge into very small places, there is a grab-it tool, and another device that is a magnet pencil shaped to retrieve small tools from spaces otherwise inaccessible. The office engineer who is not too accustomed to field work and ladders should use one of the new sure-footed ladders that are hydraulically stabilized to adjust itself to uneven ground and surfaces.

The troube shooter and field worker finds many new labor saving devices. For close quarters there is a special pipe wrench and a drill with handle shaped for this purpose. An internal pipe wrench will remove broken pipe, bushings and short nipples and there is another tool to remove nuts and screws that are stuck.

A soft hammer (don't laugh) has a spring inside its head to cushion the blow to eliminate chip, spark or mushroom effect and there are vises which will accommodate themselves to the shape of any object. Saws, of course, are portable to-day, and there is one for making keyholes, even a reciprocating saw for roughing in that needs no starting hole. It even contains a built in blower to blow sawdust away. Incidentally, a concern in Cincinnati does a nice business of renting tools.

Bathroom and Kitchen

When you sum it all up as a subject, it is amazing the amount of thought that has been applied to the bathroom and its services. People today are annoyed by what once was considered as trifles. So the toilet is produced with a luminous seat, a paper roll holder slides off with nothing to take apart, and an automatic bowl cleaner inside of the tank works with each flush to eliminate odors, stains and bacteria. The tank cover may be of unbreakable plastic in several covers with integral rim or separable tank rail guard to keep articles from falling off. The tank float may be of plastic to make it leakproof, but a real departure from the past is the water closet itself which may actually be sewerless. Engineers are striking out to-day unfettered with the past and are doing some real thinking.

The bathtub can have a gasketed door in the side for easy step in, or be of regular dimensions, but with exterior dimensions less than standard to save space; or it can be one that combines with it a lavatory, bidet, infants bath, shower and footbath. For construction work where each trade walks over the other trade's work, and I have never seen it otherwise, the bathtub needs protection. This is well recognized now by providing a sprayed coat which can be peeled off when the work is all complete, or a coating that can be washed off, or a corrugated water repellent unit that fits inside of the tub.

The bathroom can have an overhead combined light and electric heater which will save floor space, reading lamp with magazine rack, sun lamp in wall, night light, floating soap, woman's urinal, and even sliding doors to provide privacy for combined use of fixtures. Wall hung lavatories can have storage space below and the shower can have a head which moves down in action, but returns when through to drain and flush itself of dirt otherwise retained in the water.

Although the kitchen contains more equipment than formerly, it is forever shrinking in size in small homes. However, in homes built recently there is a tendency to get such equipment larger for, as learned, the kitchen sells the house. For a house built to a low price, or for close quarter apartments, there is a kitchen unit 27 inches wide which combines a refrigerator, drawer, drainboard and a 3-burner gas range in 4 sq ft of floor area.

New Hospital Dedicated in Detroit

A new 211-bed hospital has recently been dedicated in Detroit, Mich. The Greater Detroit Hospital Fund, the Jewish Welfare Federation, and the Allied Jewish Campaign co-operated to promote and finance this modern addition to that city's medical facilities. The building is shown below.

Of pavilion-type construction, this general hospital is located on a 34-acre site and is the first unit of a projected medical center which will include outpatient facilities, a nursing school and dormitory, convalescent building, physicians' building, and additional patients' wings.

The following were associated with this project: Albert Kahn, Associated Architects and Engineers of Detroit, architects and engineers; J. J. Golub, MD (formed executive vice president, Hospital for Joint Diseases, New York), consultant; E. A. Eichstedt, Detroit, landscape architect; Institutional Division, Designs for Business, Inc., New York, interior decorations and furnishings; and O. W. Burke, general contractor.

Sinai Hospital, Detroit, is part of a projected medical center.

Effectiveness of The Fog Filter

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The use of water is probably the oldest method of dust control; in fact, a British patent was issued in 1713 to the inventor of a wet dust control device. While methods of application have been varied, this discussion, which appears through cooperation of the American Industrial Hygiene Association, covers high pressure spray or fog.

ONE practical application of water spray to an industrial process was the Brasset tower (Fig. 1) for removing dust from blast furnace gases. Pickard describes it as "a cylindrical shaft packed with hurdles upon which sprays of water play as the gases pass upward through them. At the top of the tower, the gas is subjected to an intensive spraying action and given a rapid circular motion." Dust loadings for this device ranged from three to eleven grams per cubic meter at entrance and from 0.3 to 0.7 grams per cubic meter at discharge. This being a primary separator, the tower was followed by a cloth collector.

The fog filter which we are to discuss came into being after observing the effect of high pressure water spray

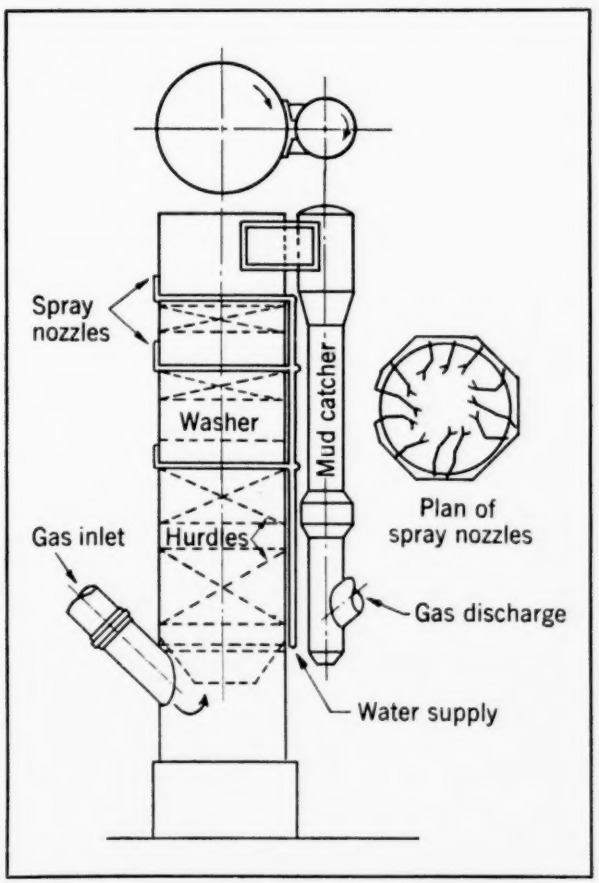

Fig. 1. Brassert washing tower and mud catcher.

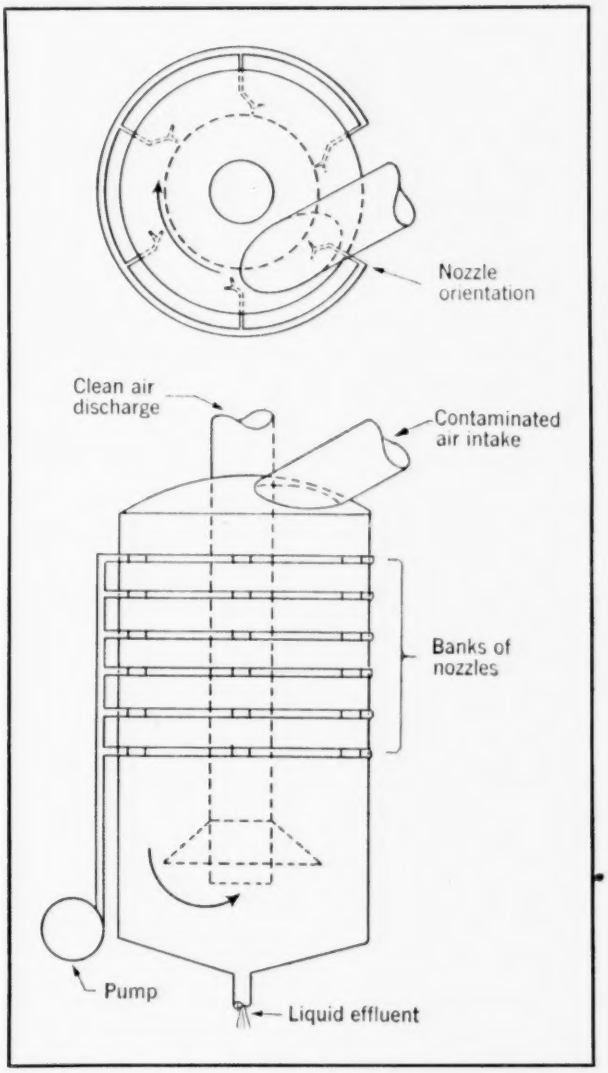

Fig. 12. Typical fog filter.

(fog) used to precipitate fine silica dust. The original fog chamber was rectangular in shape and, though effective, produced a rain of mud for several feet around the discharge from the unit. This undesirable feature was eliminated in subsequent designs by placing the fog or mist in what appears to be a conventional spray tower (Fig. 2). There is a marked difference, however, since a large number of nozzles are spaced throughout the length of the tower in parallel horizontal planes to discharge at a common angle. A high angular velocity is produced by the combined effect of the nozzles and the nearly tangential entry of the air into the fog chamber. The air is discharged through an inner shell which is concentric to the outer shell. This design incorporates some of the advantages of the cyclone to separate droplets and agglomerates from the air stream.

TABLE 1—PERFORMANCE DATA FOR THE FOG FILTER ON INDUSTRIAL GASES

Location	Contaminant	Air Flow, cfm	Spray Press., psi	Scrub. Fluid		Concentration mg/cf		Efficiency, %
				Kind	Rate, gpm	In	Out	
Oil refinery	H_2S	1000		H_2O	20	10 to 45000 ppm	Less than 5 ppm	Over 95
Drum concentrator	SO_2 H_2SO_4	328 "	400 "	H_2O "	20 "	3.4 64.8	0.3 0.95	91.2 98.5
H_2SO_4 Plant Chamber Process	H_2SO_4 SO_2, SO_3	125	500	Soda ash	8.6			99
Refinery	H_2SO_4 mist, SO_2, SO_3	1000 "	400 "	H_2O "	20 "	100 to 200 ppm	Less than 5 ppm	100 Over 95
Fertilizer Plant Acidulator	H_2SO_4 Fluorides, Solids	4500 " "	400 " "	H_2O " "	25 " "	6800 7080 4780	100 40 450	98.5 99.4 90.6
Fertilizer Plant Acidulator	H_2SO_4 H_2SIF_6, H_3PO_4	280 " "	450 " "	Soda ash " "	5.1 " "	36.3 10.7 15.5	1.4 3.0 0.7	96.1 70.6 96.7
Cellulose Plant	HCl, H_2SO_4	215 "	450 "	H_2O "	10 "	412 25.6	0.34 6.3	99.8 75.5
Chemical Plant	Phthalic and Malic Anhydride	2000	400	H_2O	20			90
Water Works, Recalcining of waste water softening salts (1700F)	CaO and Carbonic acid	500	350	H_2O	9			90
Laboratory	SO_2 CO_2	227 "	450 "	Caustic "	6.9 "	70.1 701	1.2 686	98.3 3.4
Laboratory	Chlorine gas	2300	400	H_2O	6	0.159	0.006	96.9

There is considerable information available at present concerning the effectiveness of the fog filter for removing certain of the better known contaminants. Likewise, there remains a vast region of unknown potentialities. It is generally conceded that the chemically reactive gases are more easily collected with the fog filter than with other conventional types, although a high degree of chemical reactivity is not necessary for high collection efficiencies. Good performance has been indicated on certain fine dusts and fumes, some oils, mists, and odors. Similarly, poor performance has been demonstrated on some hydrocarbons, CO_2, some organic dusts, and other contaminants. This poor performance may or may not be an indication that the fog filter is not applicable to to the particular contaminant. Modifications have been made in some instances which have greatly improved removal efficiencies for certain contaminants which had previously resisted its action.

The fog filter, because of its limitations and the great diversity of engineering processes, must be engineered to the job. It appears to be more effective on dust containing particles less than ten microns in diameter, although with a companion unit it will remove a wide range of particle sizes.

The fog filter is self-cleaning. It is necessary for some applications to use special alloys in order to protect against corrosion. Water containing certain dissolved salts, and suspended solids, tends to clog the small orifice nozzles, therefore, making it necessary to clean or flush them with greater frequency than would ordinarily be necessary if clean water were used. However, the fog filter is easy to maintain since nozzles can be removed and cleaned without necessitating shut-down of the equipment.

Effect of Design on Efficiency

Collection efficiencies for the fog filter can be brought to almost any desired level for many materials by the following means:

(1) Increasing tower height
(2) Compounding stages
(3) Controlling air volumes
(4) Regulating liquid flow
(5) Regulating spray pressures

Although the fog filter is large in comparison with certain of the dynamic precipitators, it is not as large as the packed tower scrubber. It is about one-half the size of the conventional spray tower and somewhat larger than electrical precipitators of comparible capacity. Actual floor space requirements are not great.

Operating Costs

Power costs are comparible with other high efficiency collectors. In general, the power required is about two horsepower per thousand cfm, although this will vary with the size of the unit and the specific design. Water required may range from five to ten gallons per thousand cubic feet of air for units of 5,000 cfm, depending upon application. Liquid flow rates are higher for small units than for large units. Resistance through the unit is less than that found in most high efficiency collectors and

ranges from one to four inches of water with about two inches being average.

Initial costs vary depending upon size and application but will approximate $1 per cfm for dust and $2 per cfm for gases and fumes. Fog filters handling less than 5,000 cfm will have a higher unit cost than those mentioned while units handling more than 10,000 cfm will be less in unit cost.

Since the fog filter costs somewhat more than conventional low pressure scrubbing equipment, it may not be economically sound to install it where equipment of lower cost will give adequate performance. For example, when high collection efficiencies are not desired, or when the dust has an insignificant amount of particles less than ten microns, a conventional separator may equal or excell the fog filter in performance.

Performance of Fog Filters

Performance figures for the fog filter on gases shown in Table 1 are based on both plant and laboratory studies. Other studies on dusts and fumes show efficiencies of the same order. Both full scale installations and pilot models were used. Efficiencies obtained by using the pilot model are in general lower than those found in actual installations. This fact is shown in Table 1. Two tests are reported from fertilizer plants. The first is from a full scale installation using water as the scrubbing fluid, while the second test is from a pilot model using soda ash as the scrubbing fluid. While this is not a fair comparison, since different scrubbing fluids are used, similar pilot tests in which water was used as the scrubbing fluid indicated efficiencies of 39% for H_2SO_4 collection and 55% for fluorides. Thus, these efficiencies are much lower than those found in the first case.

The quantity of information at hand concerning the effectiveness of the fog filter as a dust collector is not great, although that which is available indicates good performance for the unit. The fog filter has a broad field of application. It appears to be a particularly attractive device for applications involving hot gases, explosive mixtures, reactive gases, and certain toxic or otherwise dangerous or obnoxious dusts, fumes, or mists. In addition to being an effective tool for combating air polution problems, the fog filter may be useful as an integral part of certain chemical processes, thus greatly reducing the extent of possible air polution problems. In general, any air cleaning problem which can be solved by wet methods is a potential application for the fog filter.

Electrical Measurement of Corrosion Rate

A recent laboratory study by the National Bureau of Standards proves for the first time that the rate of weight loss of a piece of steel corroding normally in soil can be measured electrically, without actually weighing the metal. Conducted by W. J. Schwerdtfeger and O. N. McDorman of the NBS corrosion laboratory, the study gives further evidence that the electrochemical theory of corrosion applies generally to soils. Although the NBS measurements were restricted to the laboratory, the success of the work suggests the possibility of valuable practical applications, such as determination of the corrosion rate of a tank or other underground structure without the need for visual inspection.

When iron or steel is exposed to the soil, local differences in electrical potential develop at the surface of the metal, resulting in the formation of numerous small corrosion cells. By Faraday's law, the rate of weight loss from corrosion is proportional to the current.

The NBS-demonstrated measuring technique is based on the fact that the current in a corrosion cell can be expressed in terms of the values of anodically and cathodically (positively and negatively) applied direct current, from an external source, that will just reduce the cell current (corrosion current) to zero. The relation is: $i_o = I_p I_q/(I_p + I_q)$, where i_o is the corrosion current, and I_p and I_q are, respectively, the cathodically and anodically applied currents required to reduce the corrosion current to zero.

When a single piece of metal is exposed to a corrosive medium, as in the NBS study, it is obviously impossible to measure all the cell currents directly. Here the corrosion current, made up of innumerable small cell currents, must be determined indirectly, if at all, from changes in slope of curves of applied current against overall potential of the metal. The NBS study demonstrates for the first time that the total corrosion current i_o—and thus the weight loss—of a single piece of metal normally corroding in soils, and presumably in other aqueous media, can be determined by the equation.

In establishing the feasibility of the indirect measuring technique, weighed steel specimens, differentially aerated, were exposed at the Bureau to five corrosive soils for approximately two months. The soils ranged in reaction from very acid (pH 2.9) to very alkaline (pH 9.6). Because of the possibility of changes in rates of corrosion during the two-month period, polarization curves were obtained at intervals throughout the exposure period. At the end of this period the specimens were removed from the soils, cleaned, and reweighed. Actual weight losses were compared with calculated weight losses. The calculated values of weight loss differed on the average from the actual values by approximately 4%.

This technique for indirect electrical measurement of corrosion rate appears to have possibilities for extensive application both in the laboratory and in the field. In laboratory determinations of the corrosion rate of certain materials, for instance, the weight loss resulting from corrosion might actually be exceeded by the cleaning error. The electrical method makes possible much more accurate comparisons of the corrodibilities of such materials. For field determination of underground corrosion the electrical method, if it proves practicable in the field as well as the laboratory, would have several advantages in addition to obviating the need for excavating the underground object. Although in some soils ferrous metals corrode at a constant rate year after year, in other soils corrosion gradually slows down and in time may cease. The electrical method measures the present corrosion rate, which is likely to be of greater practical interest than the history of past corrosion. Furthermore, the electrical method does not involve the removal of corrosion products, which often inhibit corrosion.

What Would You Do?

Replies to engineering and operating problems of interest to the industrial plant engineer

Conducted by
NATHAN N. WOLPERT
Associate Editor

AS an industrial plant engineer, have you a problem that you would like to see discussed in this department, or do you have some comments that you would like to add to the discussions scheduled for coming issues. In either case, the Editor would be pleased to hear from you.

This Month's Problem

There are several methods used for welding stainless steel pipe for both shop and field work where the weld is to be made manually. Which do you consider the best method for such use? With the method recommended, are there any precautions to follow to insure a good weld?

Answers to This Month's Problem

Many qualifications must be made in answering the question regarding the best method of welding stainless steel pipe.

If the pipe involved is to be welded under shop conditions where welding will be in the downhand position, and the pipe wall thickness is standard or greater, then the Aircomatic process is recommended. Unfortunately, at the present time, techniques have not been developed for this process to the welding of pipe in horizontal position. Therefore, it is limited to shop welding.

For the field welding of standard wall pipe and heavier in all positions, the use of standard stainless steel electrodes is recommended. Stick electrodes can be used with assurance of high quality welds when welding in all positions.

Although the previous remarks apply to standard weights of pipe, much stainless steel is used in tube weights—that is, thin wall pipe. For this class of service, stick electrodes may be used for position welding or the inert gas tungsten arc welding process may be used. This latter process is particularly suitable for thin wall materials since it permits the welding of stainless steels without any flux and therefore eliminates the necessity for post-weld flux removal. This inert gas process may be used for welding tubes in all positions.

Stainless steel pipe and tubes, particularly in the smaller diameters, may also be joined by brazing. Stainless steel fittings such as ells and tees are available for this type of assembly.

The precautions necessary for all of the welding processes are essentially the same—the pipe ends must be thoroughly cleaned before welding. The joints, particularly of thin wall tubes, must be carefully and accurately aligned so that a full cross section weld can be produced throughout. In short, it is important to assure good welding practice on stainless steel. As for the use of pre- and post-heat, this is dictated by the particular analysis involved. In the case of chrome nickel stainless steel, as a general proposition, it is not wise to employ post-heat. In the case of straight chrome steels, the particular analysis involved will dictate the type of supplementary heat needed.

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The inert-arc method of welding is a rather recent development, first being used commercially in 1942. In the last few years, it has achieved a reputation which bids fair to make it the chief method for welding stainless steel piping in the future. In inert-arc welding, an arc is struck between the pieces to be joined and a single tungsten electrode, while an inert gas, either helium, argon, or a mixture of both flows around the fusion zone, shielding it from the oxidizing elements in the atmosphere. Either a-c or d-c can be used, but d-c with straight polarity (work positive, electrode negative) is recommended for welding stainless steel piping in the thicknesses usually encountered. The tungsten electrode is virtually non-consumable and does not permit carbon pickup. (A consumable electrode and a separate filler rod are used for welding on a production basis.) Filler rods are bare and can be of the same composition as the base metal since there is little or no loss of chromium or other important elements in the arc. For manual inert-arc welding, it has been found that argon is slightly

Problems for Coming Issues

March Issue

One of our factory buildings is long and narrow. Part of it is used for machine operations and part for large part assembly. Some dissatisfaction has been expressed with the present heating and the installation of elevated spot unit heaters has been suggested. Are there any rules for the good installation of such heaters?

April Issue

A 3-story building is to have a standpipe system installed. Is it possible, as this is only a 3-story building, to have the system served directly from the street main without a roof tank? How would the service line be connected in the basement?

better than helium for providing the blanket of inert gas around the weld zone. Argon is heavier than air, is slightly cheaper to use for manual welding, and tends to maintain a more stable arc, particularly when low welding currents are used. Helium gives better penetration and permits higher welding speeds, properties which make its use highly desirable in automatic inert-arc welding.

The inert-arc method of welding possesses several important advantages not realized by any other welding process. It produces welds of greater penetration, even if the edges to be joined are not beveled. In fact, it is unnecessary to bevel the edges of plate up to 1/8-inch. The puddle is more easily controlled with this process than normal arc-welding. It has been said that inert-arc welding combines the ability to control the puddle inherent in oxy-acetylene welding with the speed of orthodox arc-welding. The greater speed and control result in less overheating in the weld zone and less consequent carbide precipitation. In addition, there is no spatter in inert-arc welding, and since bare filler rods are used, there is no slag to remove from the finished weld. Inert-arc welding torches are well-designed and easy to use.

The puddle in inert-arc welding tends to be quite fluid; consequently when welding in other than the downhand position, the puddle should be kept rather small to insure complete control. If this precaution is observed, the inert-arc process can readily be used for all-position welding. Some minor disadvantages stem from the inert gas used to prevent oxidation.

While neither argon nor helium are poisonous, they are nevertheless not healthful to breathe, and adequate ventilating facilities should be available in the shop. Also, in order to insure an effective blanket of inert gas, care must be taken to prevent circulating air or breezes from blowing away the gas and thus removing the oxidation preventive. This latter precaution is particularly true when welding out-of-doors. It can be seen, however, that these relatively minor drawbacks are inconsequential compared to manifold advantages of inert-arc.

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Answers to Previous Questions

The following discussion relates to the December problem regarding winter ventilation of a small building used as a garage in which truck motors are frequently serviced.

A solution to the problem presented in the December issue seems quite simple. If this garage were in my jurisdiction, I would not design any ventilating system. I would, however, use a 2-inch to 3-inch diameter flexible tube fastened to a piece of rigid pipe by means of brazing or similar method. I would then punch a hole through the brick wall (assuming the wall to be masonry), slip the pipe through the wall so that it would project several inches beyond the wall, and then point up the space around the pipe with cement mortar.

The flexible tube would be slipped over an exhaust pipe and the fumes would, consequently, be propelled through this additional length of flexible tubing to the outside. In this manner the garage doors could be kept closed, the garage comfortably heated, and the exhaust gases removed from the trucks. If the diameter of the tailpipe is not the same for each of the trucks, the flexible tubing used should be larger than the largest pipe (1) to prevent undue resistance to the flow of exhaust gases through this additional tube length and (2) to permit the use of an adapter between the exhaust pipe and the flexible tube to compensate for the variations in the diameter of the tailpipe.

In the event that this garage is immediately adjacent to other buildings, pipe stubs protruding from the masonry wall could be fitted with a 90 degree elbow and extended above the roof line providing this will not cause a nuisance. This pipe extension should be bent with a sweeping radius rather than be fitted with closed radii pipe fittings.

J. R. Haugan
Plant Engineer
Union Special Machine Company
Chicago, Ill.

The following replies are in answer to the problem discussed the previous month. The question was related to the defrosting of cooling coils in a storage room.

Frost on cooling coils is a deterrent to efficient heat transfer and maximum economy of any freezing plant. The limit to which frost build-up is allowed, is a matter of the operator's acceptance of certain maximum temperatures in the room and the length of time he is willing to allow for defrost by any of the standard means in use today. Therefore, a visible indication of this maximum thickness on the pipe coils can be obtained by a "feeler" installed near a tube, which when touched by the frost will indicate a certain predetermined thickness. At best, this is a very uncertain and poor way of knowing when to defrost.

By determining the amount of moisture given off by the frozen food (respiration), a close approximation of the weight of ice deposited on the coils can be reached. Converting to volume and dividing by outside surface area of coils, we set the thickness of frost (approximately) that will form. This is an approximate method, because the volume of frost, against the volume of ice for a given weight of ice, is not the same; the volume of frost is larger.

Door openings, varying vapor pressures due to permeation and human occupancy, are also additive factors towards increasing frost thickness. Since these are not constant factors, the thickness of frost will vary tremendously over a set period of time intervals. A simple mathematical calculation, therefore, to determine thickness of frost (and by this, to know when to defrost) is not a good solution.

There are means of preventing frost formation entirely by means of spray solutions which will keep the coil clean at all times. Disadvantages of this method are the necessity of spray piping and nozzles with their attendant maintenance problems, and the need of constantly maintaining a rich enough "liquor" to keep the freezing point lower than coil temperatures.

Use of water or hot gas for defrost is becoming more widely accepted with the hot gas method enjoying greater popularity at present. Various means of defrost are on the market which involve extra equipment such as re-evapora-

tors, electric or hot water heaters for a supply of heat, or storage facilities for the heat of compression during the refrigerating cycle. Disadvantages of these methods are apparent because of the requirements for: extra equipment, installation space, special cooling coil design, extra piping for the defrosting medium and attendant maintenance problems. Probably the most important disadvantage is the possibility during defrost of the hot gas condensing to a liquid before returning to the compressor resulting in slugging and compressor failure.

There is available, however, a defroster that (as all other defrost methods) obviates concern over frost thickness by constantly maintaining a clean coil with timed defrost cycles. The speed of defrost is fast enough to prevent room temperature rise beyond acceptable maximums and can be repeated often enough to maintain a clean coil at design room temperatures. The advantage of the use of this defroster is that it can be installed in an existing system with no extra piping required beyond the one line from the defroster directly to the cooling coil just between the expansion valve and coil.

Russell L. Dobrin
Chief Engineer
M. Blazer & Son
Passaic, N. J.

When the room temperature begins to rise and the operator must decide whether the cause is increased load or frost on the coils, the question can be answered in most cases by instrumentation.

Frost is the condensation and freezing of moisture on a cooling surface. This accumulation is actually an insulator which decreases the overall coefficient of heat transfer. Textbooks state that one inch of frost is equivalent to a 25% reduction in heat transfer. Manufacturers normally rate their equipment from 20 to 25% less when it is to be used under frosting conditions. This layer of insulating material reduces the heat transfer from load (in most cases the room air) to refrigerant, and the cooling equipment does less work.

Since the formation of frost effects the performance of the refrigeration system, the proper time to defrost is indicated by instruments, usually present in the installation or which can be readily placed in the system. The type of instrumentation depends upon the method of refrigerating the cooling unit.

If the room air or product is cooled directly by the refrigerant in the cooling unit, the suction pressure will be a direct indication of the loading of the system. The reading of a pressure gage can be recorded with the normal loading of the unit and the surfaces frost free. When frost has formed to a significant point and the loading is still approximately the same, the pressure gage will read much lower indicating the presence of an insulation which is preventing the unit from doing its proper amount of work. Conversely, if the suction pressure is higher than normal, it indicates an increase in loading not possible with a lower rate of heat transfer. The suction pressure comparison makes a simple and satisfactory check on frost accumulation on direct expansion cooling units. If a number of different units on different loads are connected to the same condensing unit (not always good engineering practice) then the average suction pressure is not an indication of frosting on a particular unit. Most direct expansion systems are designed with a single load per machine.

If the system is indirectly cooled, that is, the refrigerant cools an intermediate fluid such as a brine, then the temperature difference between the entering and leaving brine of the unit is a direct indication of the cooling performance. Brine systems are usually designed with a small temperature difference or "split" across the unit. By installing thermometers at the supply and return of each unit, these temperatures are readily available. The operator notes the split under normal loading with frost-free conditions and will find that the difference decreases as the surfaces become frosted. This is to be contrasted with an increased load which widens the split. Since brine systems are usually designed for multi-load operations, the temperature differentials of the various units can be readily determined and the effect of the frost on each unit ascertained.

On some special types of cooling surfaces, such as large cast fins on pipe, it has been the accepted practice to defrost when the spaces between the fins become filled with frost. Since coils of this type are customarily used on large installations with considerable thermal inertia, the effect of frost is not readily felt in the room temperatures as changes are slow. However, where maximum performance is needed, instruments will give a much more accurate indication of frosting conditions than the visual method.

John A. Holbrook
Head, Refrigeration and Air Conditioning Dept.
Belden-Porter Company
Minneapolis, Minn.

Order Large Air Conditioning Systems Now

According to a bulletin issued by Syska & Hennessy, Inc., consulting engineers, New York, N. Y., there will be a delay in obtaining component parts for large air conditioning systems because of the demands made by the defense program.

For example, investigations by this company disclosed that the following manufacturing periods are required for the items mentioned: Centrifugal compressors, 5 months; electric motor drive, starters and gears, 16 weeks; turbines, 12 months; steam condensers, 16 to 20 weeks; reciprocating compressors, evaporative condensers, fan coil air conditioning units, 4 to 6 weeks; absorptions refrigeration machines, 5 months.

The demand for all types of air conditioning equipment substantially exceeded the available supply last summer. Manufacturers are providing for a 25% increase to the available equipment over that which was available last Spring. But if the demand exceeds this total amount, there may be a longer delay for equipment delivery. To project an air conditioning installation, even one of medium size, for operation this summer, it would have to be initiated now.

NEWS OF EQUIPMENT AND MATERIALS

Use the prepaid postcard opposite page 143 for securing additional information on items described in this department.

Industrial Fin Radiation

A line of covers for its finned radiation is available from Bush Mfg. Co., West Hartford, Conn. Covers are available in either flat top type or with slanting tops.

The former are available to fit either 4 or 4 inch wide fins, for 1, 2 or 3 row high elements based on 6 inch center line spacing. End closures and corners are available in two mounting styles available in one width. With slant top covers the cover and support do not contact the finned radiation so that the resulting installation is quiet.

Industrial fin radiation is available from the maker in three types as shown in the accompanying illustration: Type R, top, of 1 inch copper tube; Type V, center, of 1¼ inch steel pipe, and Type W (bottom) of 2 inch steel pipe.

More information? Circle Item 1 on postcard, page 143

Gas and Oil Fired Furnaces

An enlarged line of Economy gas and oil fired furnaces, factory assembled and designed specifically for the small home market, is announced by International Heater Co., Utica, N. Y.

The new oil line features two assembled hi-boys of 84,000 and 96,000 Btu per hr output, two assembled lo-boys of 84,000 and 96,000 Btu per hr output, with and without vestibule, and an assembled 84,000 Btu per hr gravity model. Two new small oil counterflows of corresponding size are also in the production stage.

Additions to the gas line include three new assembled hi-boys of 65,000, 82,000 and 100,000 Btu per hr input, with and without vestibule. There are also three new gas lo-boys from 79,000 to 103,000 Btu per hr input, with and without vestibule. All of these feature smooth finished cabinets with rounded corners.

All units are convertible for either gas or oil. A new feature is a steel pan bottom on all lo-boys and gravity models.

More Information? Circle Item 2 on postcard, page 143

Valve Handwheel Will Not Slip

The new non-slip handwheel designed to turn easily and safely, is being marketed on its line of valves by The Lunkenheimer Co., Cincinnati, Ohio.

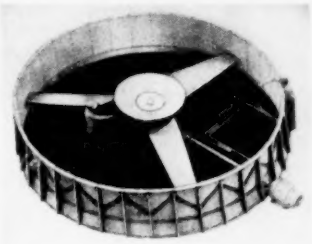
The company will standardize on this new handwheel for its complete line of bronze and iron valves. The handwheel is still made of malleable iron.

It features four finger-spaced lugs, all continuations of the strong spoke structure, projecting from the stem hub through an octagonal frame. This design permits the operator to get a firm grip on the handwheel and apply a high pressure, even though his hand may be wet or greasy. The shape of the handwheel is such that it eliminates the possibility of burned hands from contact with the valve stem.

More Information? Circle Item 3 on postcard, page 143

Large Cooling Tower Fans

A new fan series for cooling towers, or large exchangers, known as the Class 7000 Type C, is announced by Moore Co., Marceline, Mo. This new fan series brings to the market an unconventional design and application for cooling tower fans.



This series offers to industry fans of unique design. The fans are furnished in two basic sizes: Series 48 with 48 inch diameter hub, and Series 72 with 72 inch diameter hub.

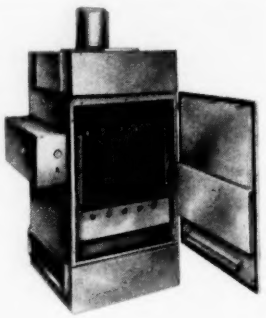
The units are furnished with any number of blades, from two to eight, as dictated by performance requirements. This feature provides a unit for peak efficiency. They are available in standard diameters up to and including 24 feet. Larger units are available on special order.

Constructed of corrosion-resistant materials throughout, the units may be ordered in Monel, stainless steel, or silicon bronze. Of special interest is the resilient mounting of the blades which stimulates a hinged joint permitting the blade to find a position in operation where centrifugal force balances out the forces of lift and drag. This feature eliminates bending stresses at the root of the blade, and allows the blade to rise and fall under shocks by turbulent air. Another feature is the unitized pitch adjustment, which provides simultaneous adjustment of all blades by means of one nut. Pitch change can be made in less than five minutes.

More Information? Circle Item 4 on postcard, page 143

Unit Recovers Oil Coolant

A redesigned Precipitron oil mist control unit available in two models, Type PO-6 and PO-12, that will recover the coolant oil from the mist and smoke generated by machining operations is available from Westinghouse Electric Corp., Sturtevant Div., Hyde Park, Mass. PO-6 has an air handling capacity of 600 cfm: PO-12 of 1200 cfm.



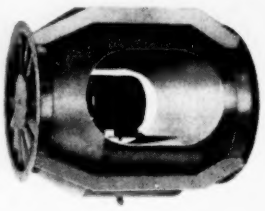
The unit is completely self contained: the heavy gauge sheet steel cabinet houses the all aluminum oil-particle charging and collecting elements with their high voltage power pack; the motor driven fan; duct connection; and oil sump. The unit is shipped factory assembled and tested all ready to be floor mounted or ceiling suspended near the machine tool.

Fan motors are three-phase, fractional horsepower, ball bearing, prelubricated, totally enclosed, for 220 or 440 volt service. The power pack operates from a single-phase, 115-volt line and consumes less than 60 watts when operating. The PO-6 is 55 inches high, 22 inches wide, 24 inches deep, and weighs 265 pounds unpacked. The PO-12 is 63 inches high, 31 inches wide, 27 inches deep, and weighs 390 pounds unpacked.

More Information? Circle Item 5 on postcard, page 143

Induced Draft Fans

A line of induced draft Bifurcators for providing controlled draft for boilers and furnaces at all times is available from DeBothezat Fans Division, American Machine and Metals, Inc., East Moline, Ill. These fans permit boilers to operate at maximum efficiency at any load, regardless of weather conditions.



The Bifurcator is a motor driven axial-flow fan in a divided housing. The motor is in an isolated chamber around which flue gases are bypassed so that the motor remains clean, accessible and within safe temperature limitations. Motors have NEMA Class B insulation. Motor chambers are lined with heat-resisting insulation.

Cost of an induced draft Bifurcator is usually only a fraction of the cost of erecting a suitable brick or steel stack. The housing will support thirty feet of ⅛ inch gage steel stub stack, the same diameter as the fan wheel, when properly braced with guy wires. Bifurcators install like a section of flanged breeching or stack. Companion flanges are included to facilitate installation. Bifurcators can be mounted in any position, horizontal, vertical or at any angle. Unlike centrifugal blowers, Bifurcators require no platforms or special supports.

Induced draft Bifurcators are built in twenty-four sizes, ranging from a 12 inch diameter fan wheel with 1/12 hp motor through 36 inch fan wheel with 15 hp motor. These units provide proper draft for high pressure boilers delivering up to 60,000 pounds of steam per hour and for low pressure boilers rated up to 190,000 EDR.

More Information? Circle Item 6 on postcard, page 143

Self-Cleaning Oil or Gas Boiler

The Anchor Jet boiler, made by Anchor Division, Stratton & Terstegge Co., Inc., New Albany, Ind., for house heating with hot water or steam using oil or gas was shown at the International Heating and Ventilating Exposition in Chicago for the first time. It is a boiler without tubes, heat absorption being achieved by a multi-pass design. Internal self cleaning is said to be an exclusive feature.

Jet action raises the sediment and foreign matter to a sump in the upper head and causes water constantly to flush the boiler so that it needs only an occasional draining of the sump.

The boiler is available in either oil or gas burner models in five sizes with capacities ranging from 300 to 850 square feet of installed steam radiation or 480 to 1360 square feet of hot water radiation.

More Information? Circle Item 7 on postcard, page 143

Totally Enclosed Motors

A line of totally enclosed motors, the Baltric, has been introduced by Baldor Electric Co., St. Louis, Mo. A feature of the line is the lamination which utilizes a large portion of the excess material to form the stator frame. By a unique design, the special laminations and an aluminum alloy are formed into a stator frame of great stability and rigidness. By this construction, the combination of the sheet steel and the aluminum alloy forms a stator frame having the same thermal expansion as if it were all made of steel. The stator frame produced in this way has light weight due to the aluminum, stability due to proper thermal design, and low magnetic hum due to the uniformly rigid clamping of the laminations.

The unicast frame and copper winding with the insulating materials form the complete stator. Taking advantage of the improved insulating materials, new slots were designed. By proper proportions, the magnetic flux is uniform throughout the motor resulting in more power, lower losses, better power factor and quieter operation.

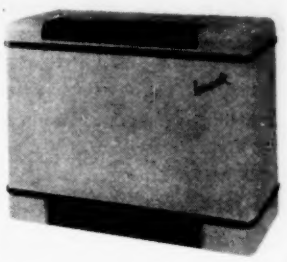
Refinements in the rotor and end plates have also been made.

Bulletin 400 is available.

More Information? Circle Item 8 on postcard, page 143

Convector Air Conditioner

A new convector type air conditioning unit, Breez-E-Fex, compact design low enough for under-the-window installations for either direct expansion or chilled water, is placed on the market by Refrigeration Appliances, Inc., Chicago, Ill.



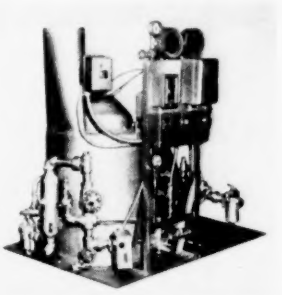
Heating coils are available for steam or hot water. Requiring remote placement of the machine, the unit is equipped with fresh air intake with damper control and a permanent washable type filter, removable without dismantling the unit. It is available in six room sizes ranging from ½ to 2 tons.

A curved, built in discharge grille provides directional discharge without short cycling. Dual speed, life-lubricated motor and centrifugal blower maintain a gentle air velocity at a low noise level.

More Information? Circle Item 9 on postcard, page 143

High Pressure Steam Generator

The Vapor-Clarkson steam generator Model 4740, developed to supply large quantities of high pressure dry steam, is now ready for industrial use in heating applications of 10 to 600 psi steam pressure, according to the maker, Vapor Heating Corp., Chicago, Ill.



Exhibited for the first time at the Chicago Heating and Ventilating Exposition in January, it can develop 200 psi pressure in two minutes from 50F cold water and produces 4,800 pounds of 99% dry steam per hour, with 82% efficiency. Using No. 2 oil or natural gas for fuel, the forced draft air and pressure atomized fire releases a million btu per hr per cubic foot of combustion space. Overall size of this package unit is 52 inches wide, 76 inches long, 78 inches high.

Hot gases spread over the 702 feet of steel coil, turning water pumped through the coil in steam. One electric motor (or gasoline engine on portable units) drives the water pump, fuel pump, blower, and magneto.

Once started, by turning one switch, automatic controls take over, causing the machine to turn on and off and produce steam only when steam is needed. Steam pressure may be changed within the range by turning one control.

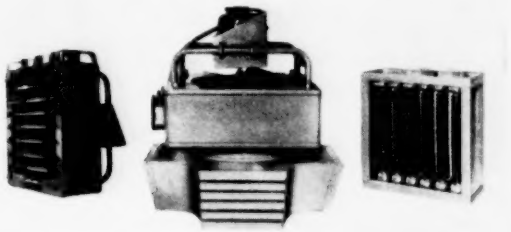
A servo-control automatically modulates the machine to produce from one-third to full capacity. Many safety controls such as steam temperature limit control, stack temperature cut-out, safety valves, electric flame control, time delay relays, and others have been incorporated.

More Information? Circle Item 10 on postcard, page 143

Electric Unit Heaters

A new line of unit heaters and heater sections incorporating electric heating elements is announced by L. J. Wing Mfg. Co., Linden, N. J.

The heaters employ the Hynes electric heating element, featuring an arrangement of flexibility mounted insulators suitable for service up to 6000 volts.



Unit heaters are available in a range of sizes delivering from 13,600 to 204,000 Btu per hr and the heater sections deliver from 25,500 to 204,000 Btu per hr. The smallest unit discharges at the rate of 235 cfm and the largest at 3600 cfm.

Three types of unit heaters are available: (1) the ceiling-suspended, downward discharge heater with revolving discharge outlets (center view) for all buildings or rooms where personnel are at work; (2) the ceiling-suspended, downward discharge heater with stationary discharge outlets (right view), for storage sections, garages, and loading docks; (3) the horizontal discharge heater with adjustable vanes (left view), for use at relay stations, pump houses, crane cabs, watchmen's shanties, and other locations where steam lines are not feasible. In summer, with the heating element switched off and the fan on, the units can be used as cooling systems.

The duct heater sections are designed to be applied to a run of duct, for process heating or replacing exhausted air with fresh tempered air.

More Information? Circle Item 11 on postcard, page 143

Small Deaerating Heater

A new development in deaerating heaters for smaller boiler plants is that of Graver Water Conditioning Co., New York, N. Y. This development is a compact package-type heater, completely equipped with all accessories including overflow level control, thermometers, relief valve and vent valve.

The heater is of the effective spray-tray type, guaranteed to reduce oxygen in the heated water to 0.005 ml per liter, regardless of fluctuations in the load or the amount of oxygen or other gases initially present in the feedwater. The vent condenser is of the internal type for maximum compactness, and this condenser, together with the self-adjusting spray valves and the tray cubes are of corrosion resistant stainless steel.

These heaters are built in both vertical types with 2-minute storage and horizontal type with 10-minute storage, and in standard sizes for capacities up to 100,000 pounds per hour.

More Information? Circle Item 12 on postcard, page 143

Air-Meter Uses Battery Power

A new battery operated power pack, combined with its air-meter, designed to provide users with a reasonably priced air velocity measuring instrument suitable for all portable applications is made by Hastings Instrument Co., Hampton, Va. It includes a six volt Hotshot battery and a converter which provides 110 volt, a.-c. output.

The pack is built for field use, protected by a hardwood carrying case. The case provides space for the air-meter, complete equipment being included in one unit.

The meter and pack are advantageous for measuring air velocities at those locations where 110 volt supply is not available. Air velocities in such usually inaccessible places as air conditioning ducts, chimneys and rooftop ventilation fans can be measured with the air-meter by employing the battery pack.

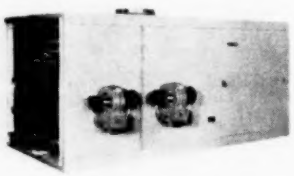
The meter is a single range, direct reading air velocity measuring instrument with a range from 0 to 6,000 fpm. The indicating meter has a logarithmic-type scale which provides readability when measuring very low air velocity movements. Of value for field uses, the meter is not affected by the length of the cable from the probe to the meter and is free from errors caused by sudden temperature changes.

Retail price of the battery operated power pack is $25. With damped meter, the air-meter is $60; undamped—$50.

More Information? Circle Item 13 on postcard, page 143

Warm Air Suspension Furnace

A new warm air suspension furnace, the OL-1250-S-100, capable of producing 1,000,000 Btu per hr at bonnet and handling 12,500 cfm of tempered air, said to be the largest ever designed specifically for overhead hanging, is produced by Jackson & Church Co., Saginaw, Mich.



For the first time on the company's suspension unit a twin burner arrangement is used. Each burner fires into a separate stainless steel combustion chamber at the rate of 4½ gph. An OL-1250-S-80, designed for 800,000 Btu per hr output on 7 gph oil rate, also is available.

A feature of the twin burner arrangement is the saving possible by operating with only one burner during mild weather when only a small amount of heat is needed. The burners are electronically controlled with electric eye protection.

The new unit measures slightly over 9½ feet in length without plenum and is 52 inches high and 55 inches wide. The furnace is constructed on a channel frame incorporating suspension rods and forged steel eyebolts. The channel frame also serves as part of the platform where facilities permit.

A 25 inch blower and 5 hp, 1,750 rpm motor are used. Four rectangular tubes carry the air around flue passages measuring 58 inches in length and 40 inches in width and varying from 1½ to 2¾ inches in depth. Air is passed over 238 square feet of heating surface. Panel liners are provided to keep outside cabinet temperatures low.

More Information? Circle Item 14 on postcard, page 143

Lightweight Flexible Hose

A spiral wire reinforced flexible hose, Flexaust, is now available in 3 new types from American Ventilating Hose Co., New York, N. Y.

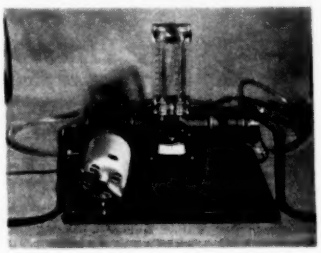
Because of their double-overlap construction, the new types are said to have double the resistance to flexing fatigue, greatly increased tensile strength and greater resistance to abrasion wear, while being lighter in weight than the old types they replace. Designated Type CWL, CWC, and CWY, the new types replace the CWS, CWM, CWR and RS types which will no longer be manufactured. The company will continue to manufacture its Portovent and Bloflex, ring reinforced and non-reinforced, hose types.

The new construction is reported to make many additional uses possible in the handling of air, gases or materials by pressure, suction or gravity flow. Illustrated Catalog 35, giving descriptions of the three types, possible uses and applications, installation data and other pertinent information is available.

More Information? Circle Item 15 on postcard, page 143

Air Filter Testing Device

An air filter testing device has been introduced by Trion, Inc., McKees Rocks, Pa. Known as the Dill Dust-Spot Tester, it is designed accurately to measure the efficiency of air filters on the job rather than in the laboratories of filter manufacturers.



The filter test methods employed in the device were developed by R. S. Dill of the National Bureau of Standards. The method consists essentially of drawing samples of dirty and clean air through filter paper. The efficiency of a filter is determined by the amount of light transmitted through the filter paper as measured by photoelectric instruments.

Advantages of the device include a continuous record of filter efficiency over a given period of time. Efficiency is determined on normal atmospheric air contaminants with no synthetic dusts used. Accurate measurements are possible, and the instrument is compact and portable, weighing only 20 pounds. It can be used to measure efficiency of any type of air filter installation in any location.

More Information? Circle Item 16 on postcard, page 143

18 In. Portable Circulator

A dual-purpose, 18-inch Roll-about air circulator is available from The Emerson Electric Mfg. Co., St. Louis, Mo. Versatile in use and adjustment, it is designed as a large-volume air circulator for offices, stores and homes. It requires no installation.

This new fan is adjustable in height from 28 to 48 inches, floor to center of blades. Vertical tilt adjustment permits directing air flow within an arc of 130° (straight up to straight down). Wheels permit ready portability.

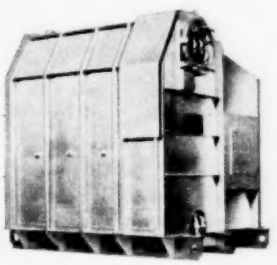
Quiet-type blades and a two-speed capacitor motor are added features that assure large volume air delivery and quiet operation, at low cost. Closely spaced spiral guards on the front and back of fan provide protection against contact with the blades. Fan is attractively styled and finished in silver gray.

Fan delivers 4350 cfm on high speed, reading taken three feet from fan. List price is $79.95.

More Information? Circle Item 17 on postcard, page 143

New Line of Packaged Boilers

A new standard line of package type water tube boilers, ranging from 7,500 to 30,000 lb of steam per hour and in design pressures of 200, 300, 600 and 900 psig, designed to meet many present day requirements for steam and high temperature hot water in industry, power, and government propects is placed on the market by Springfield Boiler Co., Springfield, Ill.



All are of a two-drum, bent tube design featuring a water cooled furnace in which tangent water tubes completely shield the full length combustion chamber. Large water capacity gives the boilers the ability to handle heavy peak and fluctuating loads. Provision for superheat up to 200F is available as auxiliary equipment.

Fired by oil or gas or combination burners, units are offered with complete burner and control assembly or can be purchased separately, enabling the purchaser to select make and type of burners and controls desired in specification.

Boilers are enclosed in a gas tight insulated steel jacket of sectional design and are suitable for outdoor as well as indoor installation. Normally, units are shipped assembled ready for use after making fuel line, water, steam, and electrical connections. However, when necessitated by limited wall openings, sectional casing and standardized sectional parts permit field assembly.

Completely assembled units can be moved easily from one location to another, making them practical for temporary and emergency installations. No special foundations are required since the units are built upon a rigid steel frame base.

Where the boilers are used as first stage forced circulation units for high pressure, high temperature water systems, the design includes provision in the boiler drums to permit natural circulation through the furnace heat absorbing tubes in event the high pressure circulatory pumps or lines accidentally fail to return any or all of the system water to the boiler.

More Information? Circle Item 18 on postcard, page 143

Electric Radiant Heat Panel

An electrical radiant heating panel only 1/16 of an inch thick which can be cemented to the ceiling like wallpaper is announced by United States Rubber Co., New York, N. Y. This new Uskon panel is a sheet of conductive rubber that is the heating unit, sandwiched between layers of thin plastic and aluminum foil; the previous panel was rigid and ¼ inch thick.

Complete radiant heating for an entire house or for a single room is possible with the panels. They are particularly useful for homeowners who add a new room or who want to supplement existing heat in such places as a den, expansion attic, or garage.

The panels are light, weighing only 6 ounces per square foot. They are bonded to ceilings of plaster, sheetrock or similar smooth material by a special adhesive. Occasionally, molding is used in conjunction with the adhesive. The number of panels required is determined by climate, insulation, and other factors, but generally, the panels do not cover the entire ceiling.

Where electricity is available for 1-½ cents a kilowatt hour or less, the cost of operation is comparable with that of other fuels.

Three sizes of panels are available, 4 ft x 6 ft, 4 ft x 4 ft, and 3 ft x 4 ft. Both outer surfaces are covered with aluminum foil to keep out moisture. The panels are rated at 22 watts per square foot (75 Btu per hour) and are available for either 115 or 230 volts. Due to the absence of abnormally high temperatures at concentrated points, hazards from burns and scorchings are eliminated.

Panels can be attached to ceiling without cutting, rebuilding, plastering, or structural changes. They are then painted with conventional flat interior decoration.

More Information? Circle Item 19 on postcard, page 143

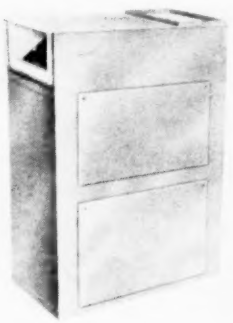
Line of Hermetic Motors

Hermetic motors from its line of single-phase and polyphase units for refrigeration and air conditioning applications, including a ¾ hp single-phase and a 5 hp polyphase squirrel-cage hermetic motor, were initially displayed at the Heating and Ventilating Exposition, by Wagner Electric Corp., St. Louis, Mo.

More Information? Circle Item 20 on postcard, page 143

Cooling Unit for Homes

A home air-conditioning unit has been developed by Curtis Refrigeration Div., Curtis Mfg. Co., St. Louis, Mo., designed for use with warm air heating furnaces. It utilizes the furnace ductwork, blower, motor and filter to give year around comfort in the home.



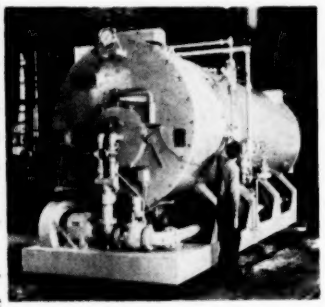
The unit covers 5 square feet of floor space and features automatic controls and trouble-free operation. It comes in a range of sizes and is quickly and economically installed. Filters are easily accessible for fast cleaning or replacement.

Air is cooled automatically after it has been cleaned and dehumidified, with dirt, dust, and pollen removed.

More Information? Circle Item 21 on postcard, page 143

Larger Packaged Generator

A new 600 hp Amesteam generator which is fully automatic, a self-contained unit, and ready for operation when connected to steam, water, fuel and electric lines, and to breeching or stack, has been added to its line by Ames Iron Works, Inc., Oswego, N. Y.



Twenty sizes are now available, from 10 to 600 hp, for pressures from 15 to 200 psi steam and for firing with oil, gas or oil-gas combinations.

A feature of the generator is the complete accessibility of all parts. The automatic controls are in an eye-level panel box on far side of unit. A davit-hinged burner head and flue cover, to simplify inspection and servicing, is included. The rear flue cover is also davit-hinged, as is the one-piece rear baffle, to save time in cleaning or inspection.

More Information? Circle Item 22 on postcard, page 143

Extra Light Insulation

Designed and manufactured for use where an efficient thermal and acoustical insulation is needed, with minimum weight requirements a consideration, Ultrafine is the latest addition to the insulation family of Gustin-Bacon Mfg. Co., Kansas City, Mo.

It is an exceptionally lightweight, fine glass fiber insulation that is fire resistant, and that will not rot, mold or decay. It is resilient and resists vibration. It has no odor and it will not pick up odors. It is not corrosive to metals, it resists attack of most acids and alkalis, and it is permanent.

The material is offered in rolls, either plain or faced with any one of 5 different types of vapor barrier facings, or die-cut to any shape for insulated appliances or equipment.

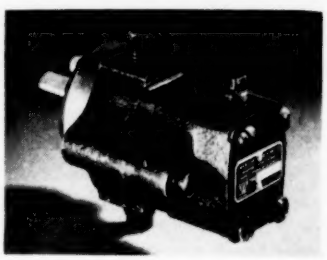
The insulation can be cut with a knife or shears and can be applied to all types of heated and cooled equipment within the temperature limits of the material (450 deg.). Its flexibility and resilience permit it to be quickly applied to irregular shaped objects without special fitting. It is useful for heating, ventilating, and air conditioning ducts, either round or square.

Applications include walls and ceilings of TV, radio stations and sound sets; to insulate metal buildings; for insulation of hot and cold pipes, nested or steam traced; for thermal and acoustical treatment of automobiles; as thermal insulation in house trailers, buses and other transportation equipment; in the lining of air conditioning cabinets; as a cold temperature insulation in coolers (to sub-zero), and as liner for warm air furnace jackets.

More Information? Circle Item 23 on postcard, page 143

Gear Type Fuel Oil Pumps

Addition of the LAM Series to its line of hydraulic pumps is announced by the Oil Hydraulics Div., Webster Electric Co., Racine, Wis. These gear type pumps are designed for use in fuel oil systems for oil transfer or filtering. With the addition of a pressure regulating valve they can be used as a supply pump for high capacity oil burners.



The pumps will handle No. 2, 3 or 4 fuel oil, or preheated No. 5 fuel oil. They are available in five sizes, with capacities ranging from 10 to 65 gph at 1800 rpm and 100 psi.

An internal relief valve is available which can be set between 50 and 200 psi by a simple manual adjustment. This valve cannot, however, be used as a control or pressure-regulating valve. The pumps are also available as 115/230 volt motor-pump combination units.

More Information? Circle Item 24 on postcard, page 143

Turbine Type Roof Ventilator

The Easy-Flow turbine wind powered ventilator, designed for commercial buildings, industrial plants, garages, farm buildings, is available from Greenheck Bros. Mfg. Co., Schofield, Wis. It is constructed with interior suspension shaft mounting that eliminates possibility of interference with its operation by ice, snow, or dust.

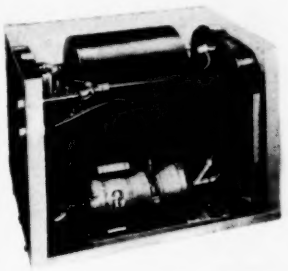
Wind direction is no factor in its performance. Made of prime galvanized steel, finished with chrome aluminum paint, it is equipped with radial thrust bearing in the base and the shaft bearing is of the Torrington needle type; bearings are oil sealed.

The unit is packed in individual cartons in sizes from 6 to 30 inches with exhaust of 14,100 to 230,000 cu. ft. per hour.

More Information? Circle Item 25 on postcard, page 143

Unit Cools, Recirculates Water

A new water-cooling and recirculating unit, named the Water Saver, is made available for use with its 3 hp packaged residential and small-store conditioners by Airtemp Div., Chrysler Corp., Dayton, Ohio.



It takes the place of the outside water supply in the air conditioner, providing a steady flow of cooled water to the air-conditioning equipment at proper operating pressure. The sealed-in water coolant prevents scaling and corrosion caused by mineral elements in many water sources, which is likely to clog pipes and reduce air conditioning efficiency.

In normal operation, the air conditioner removes the heat from the air and transfers it to water which is normally run to a drain. Then the recirculator receives this heated water and retransfers the heat from the water to outside air. By forcing the warm water through two automobile-type radiators, while a high-capacity blower draws outside air through the radiators, the water is quickly cooled, then returned to the air conditioner in a continuous cycle.

Because the unit is designed for installation with relatively small packaged equipment, provisions have been made for either interior or exterior mounting on a store roof or hidden away in a home garden, when the use of indoor space is not practical.

By providing a high-pressure flow of cooled water to the air-conditioner, the recirculating unit assures accurate temperature-humidity control at lower operating costs. Also, the use of water is avoided when pressures are dangerously low and supplies are limited.

More Information? Circle Item 26 on postcard, page 143

Gas-Fired Cast Iron Boiler

The Century gas fired steam and hot water boiler has been introduced by H. B. Smith Company, Westfield, Mass., to meet the growing demands of heating contractors. This new gas boiler is one of the company's major projects, started several years ago to commemorate its 100th anniversary, being celebrated in 1953.

Cast iron water sections are of extra large water capacity for continuous steam generation and dependable tankless heater operation. Sections are assembled left to right, and the heating capacity of the boiler is controlled by the number of sections and gas burners used. Sections are cast with heat-absorbing projections and baffles, and the space between each is sufficient to admit the standard 1-inch cleaning brush over the entire section.

Three large ports or passages with push-nipple connections are provided. One is at the front just below the water line. Two are at the back, one partly above the water line and the other at the very base of the boiler. The port at the front carries the domestic waterheating coils which can be of the instantaneous or storage type.

The coils used are copper tubes with extended surface, since the manufacturer has found that these are actually cleaner after long periods of use than the smooth tubes and are far more efficient. Having 7½ gallon capacity, they give the highest possible output with any fuel. The other two ports are connected with the circulating system.

Burners are of the gravity type, rugged cast iron, the complete assembly being mounted on a malleable iron frame with adjustable legs. This entire burner assembly can be removed from the fire box by disconnecting only one union in the gas line.

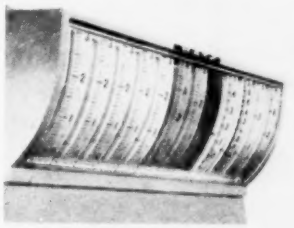
Burners are cast with raised ports, each precision-drilled. If dirt, soot or scale falls on the burners, it drops down between the ports and does not interfere with combustion.

The boiler was designed with the heating contractor in mind. Gas intake and controls, return water connections, domestic hot water connections can all be made from either the right or left-hand side according to the piping plan. Cast iron water sections can be added with companion gas burners in the event that the capacity of the boiler has to be increased to meet expanding needs. Input ratings range from 138,000 to 621,000 Btu per hour depending on size of boiler.

More Information? Circle Item 27 on postcard, page 143

Draft Gage with No Parallax

The Vertiscale, a draft gage, is introduced by The Hays Corp., Michigan City, Ind. Features include a 3-way atmospheric vent, easy one-man zero check, large identification label space, magnetic access door, fluorescent lighting for easy reading, removable units, no parallax, dust tight case, and Lucite scales.



The basic operating mechanism consists of a diaphragm, enclosed in a cast metal housing, the force and movement of which is balanced against the force of calibrating springs. The resultant force and movement of the diaphragm is transmitted through linkage to the pointer to indicate the magnitude of the draft, pressure or differential to which the diaphragm element is subjected.

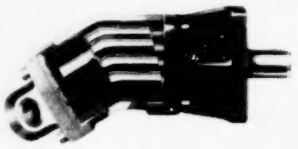
From one to twelve units of the gage can be mounted side by side in a single case. Streamlined in design, this new gage is available in four types of mounting to meet special requirements of individual installations: a semi-flush mounting, a recessed mounting for above eye-level reading, an eye-level mounting and a projected or lug mounting.

More Information? Circle Item 28 on postcard, page 143

Positive Displacement Pump

A new V-9 pump of the positive displacement type for water, brine, oil, gasoline and chemicals is manufactured by Eastman Pacific Co., Los Angeles, Calif.

Model 100 delivers from 2.4 to 7.2 gpm at pressures from 9 to 433 psi, depending upon the speed at which it is operated and the power applied.



The pump employs a new principle. There are 9 sleeves which extend into each of two cylinder blocks whose angular relation to each other causes a telescoping cylinder effect when the blocks are rotated. There are no connecting rods, cams or springs, and no lubrication is required, regardless of the type of fluid being pumped. There are only 12 moving parts and the total pump assembly is comprised of 15 parts. Weight, with bronze body, is 5 lbs.; with aluminum, 2½ lbs.

The shaft seal is designed to take inlet pressures to 200 psi. Operating temperature range is from –60 to 165F. An illustrated bulletin giving operating data, dimensions and other information is available on request.

More Information? Circle Item 29 on postcard, page 143

New Package for Insulation

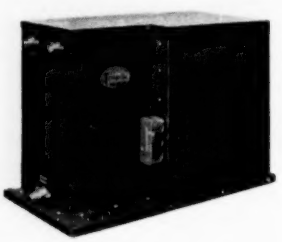
In addition to its standard line of packages for its types 6H and 4H-16 inch insulation in 250, 500, and 1,000 square feet, the availability of a new size carton containing 100 square feet is announced by Infra Insulation Inc., New York, N. Y. The new package is designed for contractors and dealers needing only a few feet more of insulation than the standard packages hold.

More Information? Circle Item 30 on postcard, page 143

Redesigned Remote Type Cooler

The line of remote type water coolers made by Temprite Products Corp., Birmingham, Mich., has been redesigned so that the compressor, condenser, cooler and all wiring are completely enclosed in metal. The entire assembly rests on a metal base.

A choice of models in either 3, 5 or 10-gallon capacities is now available. The ten-gallon model, for example, measures only 30 inches long x 12 inches wide x 15 inches high.



Inlet and outlet water connections are located on the side of the cooler near the top, and a control dial enables the user to accurately regulate the outlet water temperature within the control range to suit his own needs.

The remote cooler may be installed in any location where drinking water and a power supply are available; can serve from one to five or more wall fountains or bubblers in offices, schools, factories, and on construction jobs, and is being used for glass filling stations in restaurants, bars, cafeterias, and drive-ins.

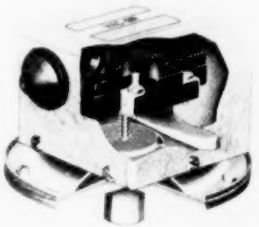
They are also said to find many liquid cooling applications in light-duty, commercial and industrial work, such as temperature-controlled photographic and X-ray development; to supply constant-temperature cool water for laboratory experiments; light or medium-load roll or jacket cooling. Beyond water cooling, the unit may be used for cooling light oils, some chemicals, and alcohol.

All models are approved by Underwriters' Laboratories.

More Information? Circle Item 31 on postcard, page 143

Inexpensive Vacuum Switch

An inexpensive vacuum switch that shuts off the power source when liquid supply runs dry has been announced by Jaycon Associates, Minneapolis, Minn. Designed for use with electric motors and gasoline engines, the Vac-on switch has numerous industrial applications as a circuit-breaker or control where the safety of equipment depends on a suction-delivered lubricant, fuel, water or similar liquid. The switch also serves as a warning control where operating conditions depend on a vacuum.



The switch mounts on the suction line and is wired into the power supply on electric motors, or the spark system on gasoline engines. When suction falls below a predetermined negative pressure (approximately 1 inch of mercury) the switch automatically cuts off the motor or gas engine.

Operating on a spring loaded, rubber diaphragm principle, the switch utilizes silver contact points for heavy duty service.

More Information? Circle Item 32 on postcard, page 143

Portable Pump for Benders

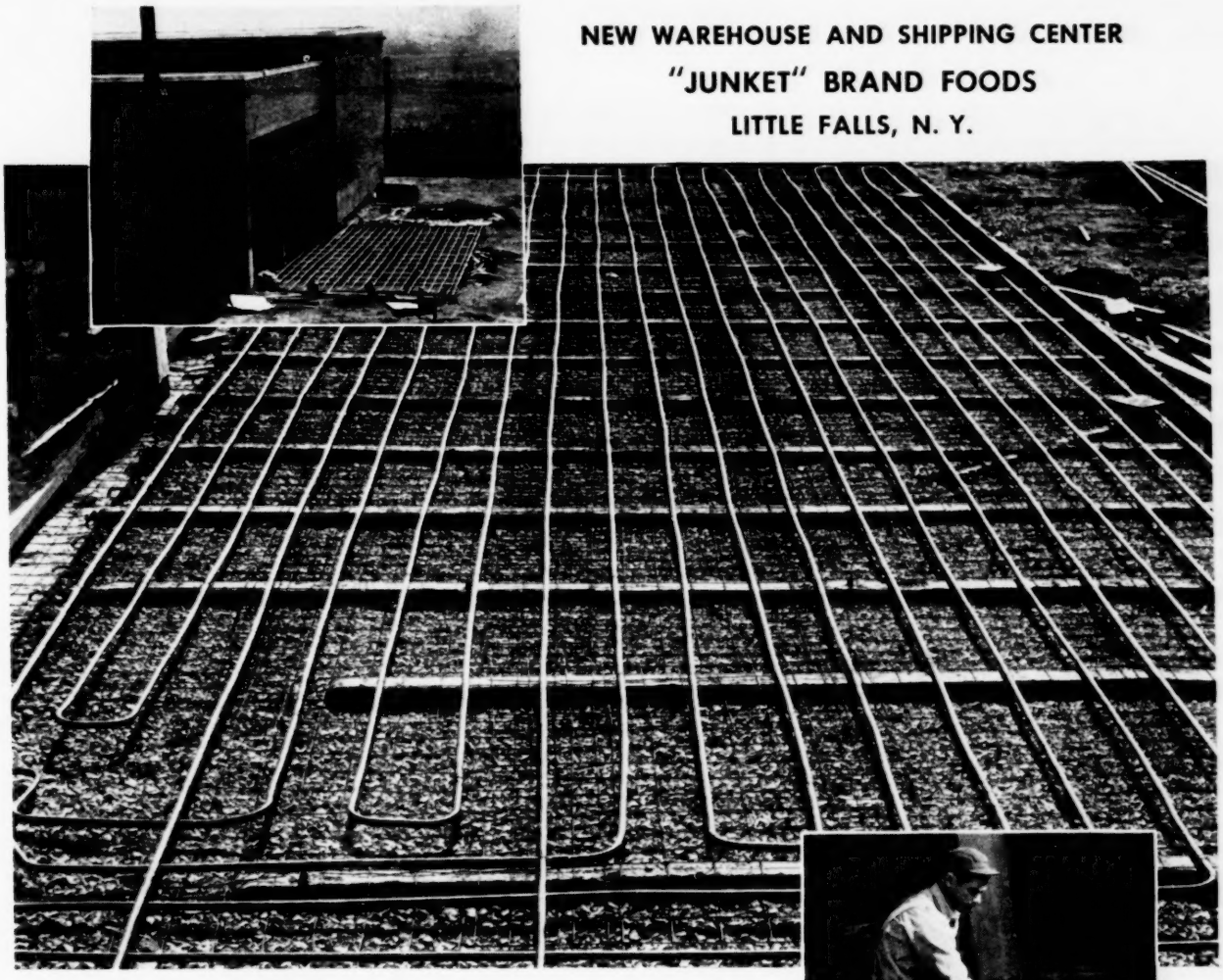
The No. 798 portable electric power pump for driving its own and other makes of hydraulic pipe benders and pipe pushers has been made available by Greenlee Tool Co., Rockford, Ill. The pump delivers 36 cubic inches of oil per minute through 4-way valve to operate 2-way cylinders for maximum intermittent pressure of 9,000 to 10,000 lbs. psi and continuous pressure of 5,000 lbs. psi.

The pump has built-in vertical ½ hp, 110-volt, single-phase electric motor with sealed, permanently-lubricated bearings and operates at 1725 rpm. A handy toggle switch at top of pump, 10 feet of cord, and 6 feet of high-pressure hose are included.

Base and top of pump are made of cast aluminum. The unit weighs 60 pounds without hose for easy moving from job to job.

More Information? Circle Item 33 on postcard, page 143

NEW WAREHOUSE AND SHIPPING CENTER
"JUNKET" BRAND FOODS
LITTLE FALLS, N. Y.



ANOTHER CASE OF *Copper* WHERE IT COUNTS!

During the winter months there will be no snow or ice troubles at the truck entrance of the new "Junket" Brand Foods Warehouse. A snow-melting system of Revere Copper Water Tube in the 20′ x 60′ concrete slab sees to that. This building was designed by Architects, Bagg and Newkirk. Heating Contractor was H. J. Brandeles Corp. Revere Copper Water Tube was supplied by the Crane Co., all of Utica, N. Y.

The contractor found the light-weight, 60′ length coils of Revere Copper Water Tube easy to handle and install. Also, its soft temper permitted bending, reducing the number of fittings used. Other features that architects, contractors and builders like about Revere Copper Water Tube are: Because it is non-rusting it will last indefinitely . . . the solder or compression fittings used make it possible to use a thinner wall tube than is possible when threaded fittings are used, with a substantial saving in metal.

Now, with restrictions eased, and quantities permissible without allotments greatly increased, there isn't any reason why your next job can't have the many lasting benefits of Revere Copper Water Tube for hot and cold water lines, radiant panel heating, underground service lines, processing lines, and waste stack and vent lines. See the Revere Distributor nearest you today. And, if you have technical problems, he will put you in touch with Revere's Technical Advisory Service.

GUIDE PLANK is used by workman to facilitate installation of 1" Type K soft temper Revere Copper Water Tube. Revere Tube also comes in hard and soft tempers in straight lengths of 20 ft.

LARGE PHOTO ABOVE shows Revere Copper Water Tube in place ready for pouring concrete.

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PRODUCT APPLICATIONS

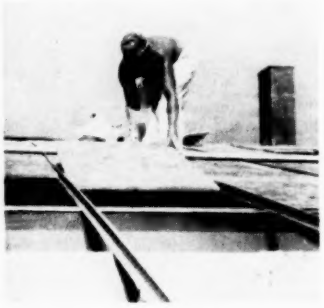
New, Unusual, or Ingenious Uses of Equipment and Materials

Conducted by WM. B. FOXHALL, Associate Editor

Roof Deck Doubles as School room Ceiling

PROBLEM: A new 20-classroom school at Perrysburg, Ohio, designed by Britsch and Munger, Toledo architects, has 54,400 sq ft of floor area. Construction cost was to be held at $690,000 in spite of specifications calling for the latest developments in lighting, ventilation and classroom equipment.

SOLUTION: One means of holding down costs was the use of 26,000 square feet of Owens-Corning Fiberglas form board as a base for the gypsum cement slab roof. The form board soffit is exposed on the interior and painted with pastel shades to blend with the painted cinder block walls and asphalt tile floors. Other ceiling areas are treated with Fiberglas acoustical tile.



RESULTS: After a 2-inch application of poured-in-place gypsum concrete, the form board applied in panels on the roof not only serves as a roof slab form but also as the ceiling for the room below with all the acoustical and insulation qualities of tile.

Camera Speeds Job Surveys

PROBLEM: William F. Allison, consultant of Rockland, Mass., having spent years and dollars on quotations that proved partially fruitless, came to the conclusion that an accounting was in order. After careful analysis, it was shown that the reason for the greatest number of lost jobs was the excessive amounts allowed in estimations to cover possible hidden obstructions. The estimator, in order to protect himself when the sales survey was a bit sketchy, would load the estimate with additional materials to overcome hidden contingencies. This was particularly true on out of town jobs. It was desirable that surveys be made clearer without requiring the engineering department to look at every job location.

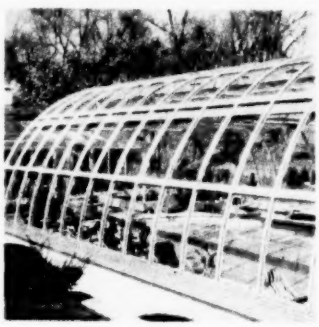
SOLUTION: Polaroid Land cameras were procured so that every salesman, using the cameras in conjunction with a scaled floor plan, could present a highly detailed survey to the engineering department. A floor plan is examined by the salesman on the job, and equipment locations are determined. Points affecting the installation are then surrounded by a ring of half-inch circles drawn on the floor plan. These circles are each numbered and an arrow through each circle points toward the installation. The salesman then stands in the position of each circle, and by pointing the camera in the direction of each arrow on the floor plan he is able to photograph all obstructions and detail in that direction. He numbers each photo with the circle number, and the engineering draftsman can refer to these photos while preparing the estimate and also during job fabrication. As each picture takes only a minute from taking to developing, no misses are made, and obstructions are completely visible.

RESULTS: A lower frequency of lost jobs is reported. The survey can be made while the area is in continuous production. Mr. Allison says that, using this method, a factory floor area of over 30,000 sq ft, 800 miles from the home office, has been successfully surveyed in less than one hour.

Clear Plastic Covers Pool

PROBLEM: A portable cover was required for an outdoor swimming pool. Cover was to be both durable and transparent to sunlight.

SOLUTION: Optically clear CR-39, a thermosetting plastic which can be hot formed to moderate curves, manufactured by Cast Optics Corporation, Riverside, Conn., was used in 4 x 8 foot sheets ¼ inch thick formed cold to an 18 foot radius. Curved panels were set in a decorative frame.



RESULTS: Plastic canopy has impact strength enough to stand any reasonable shock while the whole canopy is still light enough for one man to slide it back to a cleared concrete area in the rear, thus making an outdoor pool for summer use. Freedom from crazing and high abrasion resistance are added to excellent weathering characteristics. In the winter time, CR-39 has insulating qualities which keep heat inside during zero weather.

Heat Pump Warms Barge

PROBLEM: The barge, Blind Pass, which operates in the Gulf of Mexico, is subject to uncomfortable outdoor temperatures both summer and winter. Officials of Levingston Shipbuilding Corp., of Orange, Texas, builders of the Blind Pass, decided to heat and cool the occupied areas of the barge.

SOLUTION: The barge was equipped with a General Electric heat pump. Operated by electricity, the heat pump automatically extracts heat from the outdoor air in the winter to warm the barge and in summer it reverses the process to cool cabin.

RESULTS: The Blind Pass is the only boat on the high seas equipped with a heat pump and is the only barge in the Gulf of Mexico with this type of summer air conditioning.

(*Continued on page* 130)

Announcing!

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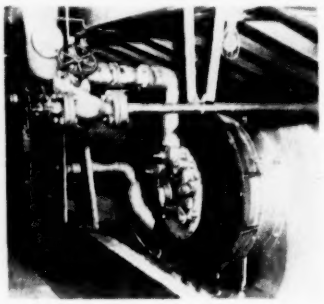
(*Continued from page* 128)

Turbine Blowers Boost Steam Output

PROBLEM: At the Brunswick, N. J. plant of E. R. Squibb & Sons, a sharp increase in steam supply was required. A new 165,000 lb per hour boiler was installed to supplement two older units. Only limited space was available in the boiler room for the location of auxiliary equipment including forced draft blowers.

SOLUTION: Satisfactory performance of Wing blowers in the older boilers caused Squibb officials to invite recommendations from Wing engineers. A Wing axial flow turbine driven forced draft blower, product of L. J. Wing Manufacturing Co., of Linden, N. J., was selected for the new boiler. Similar units had been in use on two other boilers.



RESULTS: Compactness of the blower permitted mounting directly underneath the rear boiler overhang. The blower delivers a vertical downward flow of air. Construction of an addition to the boiler room of at least 10 feet, which would have been required by a centrifugal blower, was made unnecessary, with a consequent saving in cost.

Glass Insulates School Foundation

PROBLEM: At Toledo's new Grove Patterson School, engineers desired to follow the trend toward basementless schools while protecting pupils against cold moist floors.

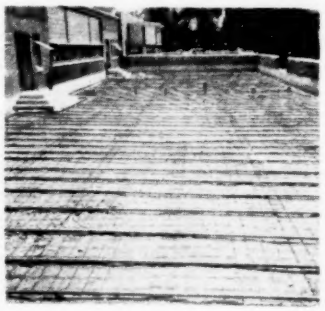
SOLUTION: The building's reinforced concrete foundation was enclosed completely in Fiberglas perimeter insulation, product of Owens-Corning Fiberglas Corporation of Toledo, Ohio. Only the fan, storage, and boiler rooms are underground in this 12 classroom building. The remaining 22,500 sq ft of floor space are protected by perimeter insulation.

RESULTS: The estimated reduction of heat loss in the Grove Patterson School because of use of Fiberglas insulation will be from 10 to 15%, designers say. Heat loss from the radiant heated kindergarten room is even more sharply reduced. Forced hot water and fin tube radiation are used throughout the building except in the kindergarten room.

Snow Melting Increases Schoolyard Use

PROBLEM: Carlisle and Springboro, two communities in southwestern Ohio, are pioneering a practical solution to the problem of providing their schools with year round facilities for outdoor recreation. One of the chief objections to outdoor winter activities was the high rate of absenteeism brought about by exposure to wet feet from melting snow and other hazards characteristic of snow or ice covered surfaces.

SOLUTION: Included as part of current school construction in the two towns are patio-styled play yards equipped with snow melting installations. Wrought iron pipe coils, product of A. M. Byers Company, embedded in the concrete surfacing will circulate heated water and antifreeze to keep the play area free of snow and ice in the worst winter weather.



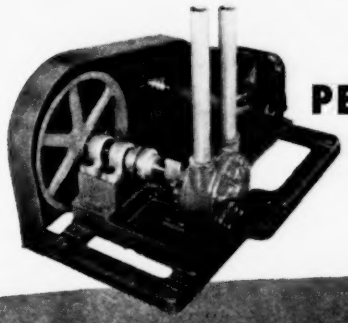
RESULTS: Snow melting permits classes in outdoor athletics to be conducted on the play patios without penalty of wet feet. Because the heated areas adjoin the entrances to the school building, they are expected to effect an appreciable reduction in the amount of dirt and slush which children bring into the classrooms.

Plastic Spray is Vapor Barrier

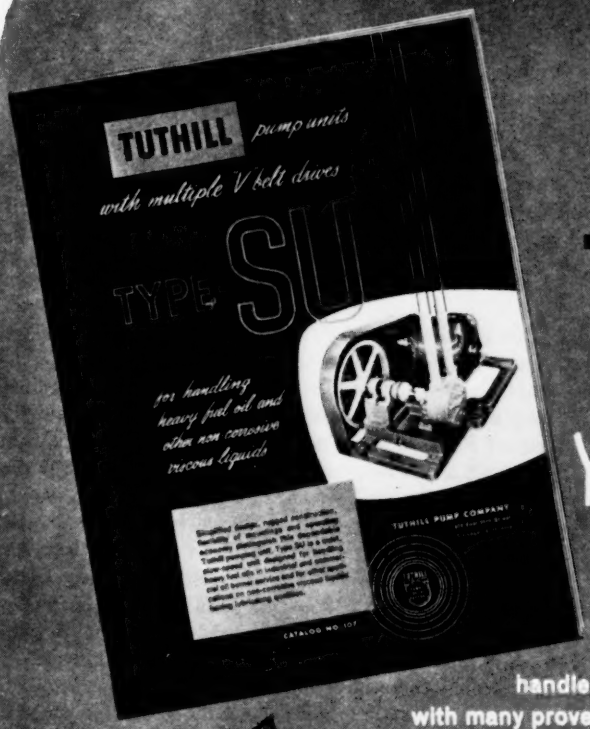
PROBLEM: Industries requiring humidity control in their manufacturing, process plants with high humidity conditions, and occupied buildings located in cold climates face difficult condensation problems where inside walls frequently are colder than the dewpoint temperature of the air. Water vapor may enter the structure of the wall and condense to cause structural damage.

SOLUTION: Plastispray, product of Progressive Industries, Inc., of Long Island City, New York, is a liquid which can be spread on a surface to form a heavy rubber like sheeting. Applied in thicknesses from 20 to 40 mils, it has a very low vapor transmission rate and will perform better than most vapor barriers of equal rating because of the absence of laps and joints. Besides being a vapor barrier, the material is also a decorative wall finish available in various colors. In addition, Plastispray can be used as a corrosion resistant flashing and lining for air conditioning ducts. This use of the material was made at the U. N. General Assembly Building.

RESULTS: A vapor barrier which prevents water damage and completely seals the surfaces to which it is applied, can be used for surfaces which may not necessarily be insulated below the dewpoint of the air. High tensile strength of a Plastispray, once it has set, and an elongation factor of nearly 250%, give an extremely long life expectancy even under adverse conditions of building sagging and vibration.



PERFORMANCE PACKED FOR INDUSTRIAL OIL BURNER SERVICE


TUTHILL pump units
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Abstracts AND Reviews

Publications abstracted in this department should be ordered direct from publisher.

CONTROL OF ELECTRIC MOTORS

With the development of electric motors came the need for proper control and coordination of the motor with the control and the driven unit. Although many motors come complete with controls, the ultimate user is often faced with the problem of selecting suitable control apparatus and that presupposes some understanding of the subject.

This book by Paisley B. Harwood, vice president in charge of engineering, Cutler-Hammer, Inc., has been in use for some time. The first edition was published in 1936 and the third edition has just been released.

There have been a number of changes since the first edition. At that time electronic motor control was in its infancy. Today electronic motor control represents an important application. The third edition has new information on circuits, devices, calculations used for the regulation of voltage, speed and tension, basic principles of regulating problems, and new wiring diagrams.

The text has been divided into 21 chapters covering such subjects as pilot devices and accessories, direct current contactors and relays, adjustable voltage controllers, automatic regulating systems, two-motor drives, alternating current contactors and relays, magnetically operated brakes, resistor design, and chapters on various motor designs.

Control of Electric Motors, P. B. Harwood. Cloth bound, 6 x 9 inches, 538 pages. Published by John Wiley & Sons, Inc., 440 4th Ave., New York 16, N. Y. Price, $7.50.

FATHER OF AIR CONDITIONING

The life of the late Dr. Willis H. Carrier, his talents and struggles, and the development of air conditioning as an industry are interestingly told by Margaret Ingels who for 33 years was a close working associate of Dr. Carrier. One of the first graduate women engineers in this country, Miss Ingels in 1948 started the huge task of research and cross checking required to obtain the necessary data. In addition she had 96 interviews with Dr. Carrier at his home during which she collected the many notes from which this biography was developed. Even in his late years, Dr. Carrier had an exact memory of the early days in his career.

Written in an easy-to-read non-technical style, the author takes the reader through the early trials of the then infant air conditioning industry. It presents a clear understanding of a man who has been called the "father of air conditioning" and who has been credited with many outstanding developments in this field.

Included is a comprehensive chronological table from the times of Leonaro de Vinci in 1500 up to 1952. Data are arranged so that at a glance the reader obtains quickly for a given period, developments taking place simultaneously in heating and ventilating (including fans, heaters and heat pumps); refrigeration; air cleaning, humidifying, purifying, washers, humidifying units and odor absorbers; air cooling, cooling coil and fan coiling coil units and systems; air conditioning and chemical dehumidifiers. A great deal of correspondence and research were required in developing this valuable presentation.

A foreword for this book was prepared by Cloud Wampler, president of Carrier Corp.

Father of Air Conditioning, by M. Ingels. Cloth bound. 5¼ x 8¼ inches, 170 pages. Published by Doubleday & Co., Inc., Garden City, N. Y. Price, $2.50.

HEAT TRANSFER PHENOMENA

Recent developments in heat transfer are presented in Heat Transfer Phenomena by R. C. L. Bosworth. It is an expansion of some material presented at a conference on heat transfer held by the Australian Branch of the Institute of Physics at Sydney, Australia in 1948. The author gives a concise account of all the more important recent advances in the field of heat flow and the subject is treated as an example of transport phenomena.

The book covers classification of transfer processes; the thermal conductivity of gases; thermal radiation; thermal conductivity in condensed phases; natural convection; forced convection; the simultaneous transport of heat and mass; the use of the equivalent electrical circuit, and thermodynamic similarity.

Heat Transfer Phenomena, R. C. L. Bosworth. Cloth bound, 5½ x 9 inches, 211 pages. Published jointly by Associated General Publications Pty. Ltd., Sydney, Australia, and John Wiley & Sons, Inc., 440 4th Ave., New York 16, N. Y. Price, $7.50.

• • •

THICKNESSES FOR UNCOATED THIN FLAT METALS—A table of preferred thicknesses for uncoated metals and alloys for sizes under 0.250 inch is listed in publication ASA B32.1-1952 published by the American Society of Mechanical Engineers, 29 West 39th St., New York 18, N. Y. Price $1.

HOUSING RESEARCH—A comprehensive report on A Survey of Housing Research in the United States, conducted by The Building Research Advisory Board has been issued by the Housing and Home Finance Agency. It is the first published comprehensive survey of housing research in the United States that has been made. This report covers groupings by subject matter and also by university or college. Paper bound, 723 pages. Housing and Home Finance Agency, Washington 25, D. C.

HALSTEAD & MITCHELL COOLING TOWERS

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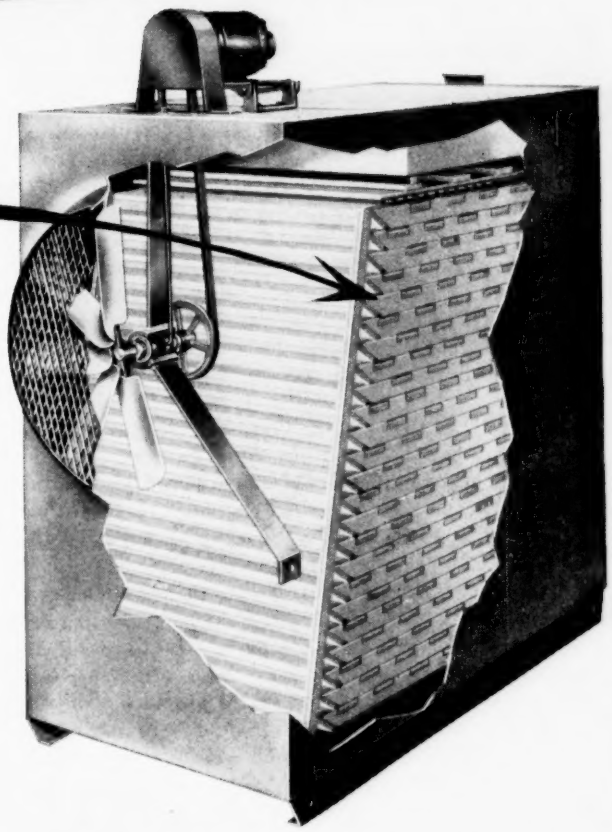
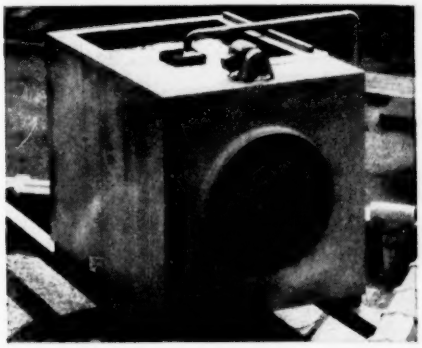
On the Wetted Deck Surface of Koppers Pressure-Treated Wood



Here's the industry's greatest cooling tower value . . . "built like a battleship" for 20 years of foolproof performance. Halstead & Mitchell's pioneering in exclusive use of Koppers pressure-treated wood in the wetted deck surface makes possible the unprecedented 20-year guarantee against rotting, and provides the industry's most effective deterrent against fungi growth. Economical, lastworthy . . . the special H & M design for water distribution eliminates, thru the use of an efficient gravity-type distributing pan, extra pumping head required on spray type towers, also cuts down windage losses due to atomizing of water. The complete assembly is with Everdur bolts . . . disassembly is easy even after years of service. Easily accessible for cleaning through inlet on back of towers in all sizes.



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H&M #CT-4000 Induced-Draft Cooling Tower supplying the condensing water for 20 HP and 10 HP water-cooled condensing units in 3-story jewelry storeroom air conditioning. Note open-type distributing pan. This installation also has remote water basin in basement for year-round operation.

2 TONS to 100 TONS

A cooling tower for all applications, from 5 to 50-ton capacities—made by Halstead & Mitchell, one of the world's largest manufacturers of water-cooled Cleanable Condensers.

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HOUSING—10 gage (.8"+) sheet-steel case with 3 coats Bitumastic lining. Electrically welded cabinet. All bolts used are Everdur for ease of disassembly after years of service.

WATER DISTRIBUTION—Gravity type distributing pan eliminates extra pumping head, cuts down windage losses, due to atomizing water.

FAN AND DRIVE—Quiet-operating stainless steel 8-bladed fan, stainless steel shaft, chrome-dipped rust-proofed pulleys. Cast iron bearing supports. Adjustable belt tension.

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Experience is my Classroom

By T. W. REYNOLDS

• CHANGES IN VENTILATION METHODS

Use of air systems at high velocity, with high temperature drop or rise, and therefore with small ducts or pipes, has been extended from the heating and air conditioning systems of tall buildings to the warm air systems of residences. High air outlet velocities tend to recirculate or move a lot of secondary air within the rooms. Hence, it is felt that much less air need be returned to the residential furnace. Of course, this greatly economizes on duct work and often eliminates some duct or ducts that never returned anything at any time.

High air outlet velocities also permit discharge outlets to be located on partitions instead of on cold exterior walls with resulting economy in duct work. The high temperature air at high velocity becomes well mixed and cooled within the air diffusers and by air mixture in the room.

Generally, in the past, the ventilation requirements for bus garages have been so worded that garages were either wastefully over-ventilated or else under-ventilated in some areas by wrong and expensive methods. There are now several bus garages of New York City's transit system which seem to have the answer to this problem.

In these garages various areas are zoned with separate heating and ventilating systems. The fuel-dispensing area is thus treated and is further separated by fire walls and automatic fire doors. This area has continuous 100% outdoor air supply. Other areas are provided with only 10 to 15% outdoor air for 50 minutes of each hour, although for the balance of each hour a program clock automatically steps up the outdoor air supply to 100%. If at any time of reduced outdoor air supply, the carbon monoxide exceeds 0.02%, the system is automatically switched by carbon monoxide detectors to 100% outdoor supply air. These detectors continually sample the air in the return air ducts.

• SOMETHING NEW

There are always new ideas, methods and devices. Thus, if you do not have a chimney on your house, or do not care if you add another, a dummy chimney can be fitted to the roof. This dummy in reality is for concealing (from view and the weather) a suitable fan for "vacuumizing" the attic. It also provides the necessary space for the fan, a thing so desirable especially in low attics. The fan system is completed by installing small ceiling registers for ventilating rooms below.

Plastic transparent guards for electric clock thermostats prevent tampering. A magnifier can be fitted to any thermometer so the instrument can be read accurately up to 6 ft away. There is a small kitchen fan that is easy to remove for cleaning. Plastic material, used as an awning is translucent to admit some light and yet keeps heat out. No longer is there a need for raising or lowering the awning. It has nothing to rot or sag.

A portable shower is available which folds up to go in the travel kit. At home the shower door need no longer be either transparent or obscure, but just semi-obscure to give some but not too much light on the subject. As for the bathtub, this can be sprayed with a liquid envelope protection to remain while construction is going on and then can be easily peeled off.

Electric heaters are good auxiliaries for underheated or occasionally used spaces. One now available can be set for 55F or 85F. If used for the sole heating of the bath room, it should be cheaper than installing a radiator with all its trim, connected pipe, and added boiler load. If such radiation is used for local heating in early fall and late spring, the house heating system need not be operated at such times.

The high frequency or ultrasonic vibrator is coming along. It coagulates fine particles of dust, smoke or fog and its use is therefore being studied for agglomerating particles of flue gas to a size large enough for removal by centrifugal methods in a cyclone separator.

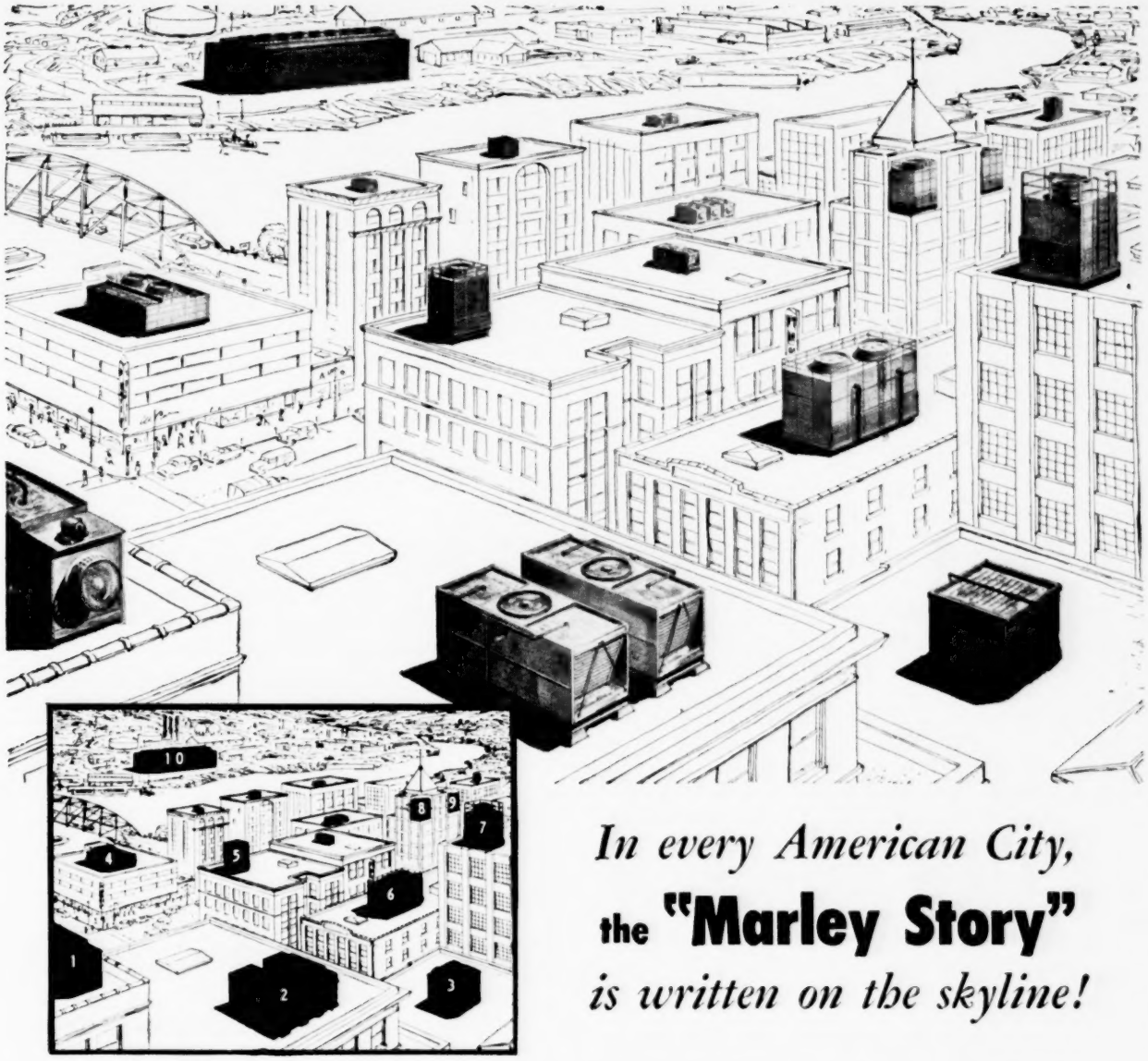
Ionics, Inc. has developed a method of obtaining fresh water from the sea, although at present, at a relatively high cost. The sea water is passed through electrically charged membranes or filters. One third the original volume of sea water is removed as a brine. Cost of de-salting depends upon power rate, the rate of flow through the device, and the salt content of the sea water. Cost may be of no moment during water shortages when the most important thing is to obtain fresh water.

From Clifton St., Staten Island to 92nd St., Brooklyn, New York City, there should be laid by now the last lap of the natural gas pipe line of the Transcontinental Gas Pipe Line Corp. Length across the Narrows and under water, 6,600 ft.; maximum depth below mean low water surface, 108 ft.; inside diameter, 24 inches; weight per lineal foot, 561 lb.; pipe wall coated ½-inch with an asphaltic mix in a 3-inch layer of extra heavy concrete.

• KEEPING THE ROOF COOL

The sprayed roof has been receiving a lot of attention of late, particularly so from the standpoint of longer life of roof. Similar publicity is being given to the cooling advantages of aluminum roof coatings, since these reflect the sun's rays; likewise to the constant flow of cool air obtained by attic ventilation. All these methods hinder the vaporization of volatile binding oils from built up roofing. Attic ventilation also provides cooler rooms be-

(*Continued on page* 136)



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1—Aquatower*
2—Steel Double-Flow Aquatowers*
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7—Steel Series V Tower
8 & 9—Asbestos Board Cased Conventional Towers
*Registered Trade Names

What kind of cooling towers do air conditioning and refrigeration experts prefer above all others?

For your answer, simply glance out your office window and review the roof-tops of the buildings around you. On hotels and hot dog stands, atop department stores and dairies, on hospitals and homes, chances are, you'll see more Marley cooling towers than any other kind.

This is so because air conditioning and refrigeration contractors know that in the Marley line—the only *complete* line of water cooling towers—they will find the proper tower for the job at hand. They know that every Marley cooling tower is backed by 25 years of specialized water cooling engineering and production—and that every Marley tower will repay its cost many times over in water savings and trouble-free service.

For the complete Marley story, get in touch with you local Marley Application Engineer. He'll help you select the proper tower to meet your specifications—a tower designed, manufactured, and guaranteed by the world's leading producer of water cooling equipment.

MARLEY

The Marley Company

KANSAS CITY 5, MISSOURI

(Continued from page 134)

low, particularly so when double use is made of the air by ventilating the rooms to the roof space.

Sprayed water droplets intercept the sun's rays before these rays contact the roof. The droplets fall to the roof and quickly evaporate, carrying heat away. Air cooled by the sprays tends to flow down along exterior walls and to cool them. When a rain storm suddenly cools a roof, it cannot warp the roofing material if this is sprayed previously to prevent such thermal shock. However, whether or not the roof is preserved, a roof spray makes the rooms on the top floor decidedly cooler, and where this floor is air conditioned, the cooling load is substantially reduced.

• VACUUM ENGINEERING

Ridding certain spaces, equipment or processes of much of the atmosphere by means of vacuum has become quite a science and a most profitable field. Air is as troublesome in some places as it is helpful in others. Thus, a vacuum that will remove air from closely packed materials will allow more efficient cooling. It is also said that recent experiments indicate moth larvae do not like to stay in furniture which is under vacuum.

In any process which uses some material which vaporizes, a vacuum will speed vaporization and also remove air which might interfere with the movement of the vapor. In the case of blood banks, a high vacuum is used to suck moisture out of the blood, thus freeing the blood from bacterial action. The blood keeps longer.

An aircraft company finds a new suction device quite helpful and most safe in the preparation of its fuel tanks for inspection or repair. Resulting vaporization more quickly removes any liquid. Recently developed, is a vacuum system consisting of a tank for collecting ashes from the basement of the home or other structure. The tank is mounted on a truck and fitted with a flexible suction hose. Such ash removal is labor saving and leaves the person and premises clean.

• USE SMALLER PIPES

To size each section and branch of pipe of all services in a project is quite a task when done with a view to economy—one not too interesting and one not done as often as it should be considering ever increasing cost and scarcity of material.

Few seem to realize that when a pipe size is increased, so likewise is the erection, insulation and painting of the pipe, or insulation and the size of connected valves, expansion joints, fittings and escutcheons. All this adds to the load on the structure. Space required for the pipe and its erection is also increased and this may add to the cost for furring, chases and pipe shafts. When you add in the increased maintenance and heat losses during operation and pick-up, additional boiler size, more air to vent, gallons of drainage, and ultimate higher replacement cost, the grand total of cost becomes a surprising figure.

In the sizing of pipe, factors of safety are usually assumed too great in number, size and coincidence. Allowances for resistance assume too many fittings and the highest for each while fouling allowances will be liberal regardless of the conditions, service and size of pipe. Finally, the nearest commercial pipe size to calculated size is selected on the upside and not on the downside.

Suppose the installation is temporary, that is, it is planned to function only for a few years. Remember, there are so-called temporary governmental buildings of the first World War still in use in Washington, D. C. Nevertheless, upon occasion there really are temporary buildings, such as defense structures and World's Fair buildings, where smaller pipes would reduce the cost and weight of critical materials.

If the pipe must be laid in corrosive soil or otherwise subjected to corrosive conditions I would again be tempted to decrease pipe sizes if only to cut down on ever increasing reproduction costs. Of course, the best method is to apply corrosion prevention if possible and economically justified.

Another method would be to re-route such portion of a pipe line as may become subjected to corrosion, decreasing pipe size as compensation for added length. Authorizations are often made to replace a pipe line when the corrosion is only in spots. There is many a pipe line as good to-day as when installed years ago were it not for corrosion of short lengths where laid in corrosion soil.

• I NOTE THAT

The Reader's Digest Building in Tokyo makes use of the heat pump and a gracefully curving brooklet in a Japanese garden as a cooling tower. This substitute for a tower comes right out in the open and needs no customary tower disguise.

Over in Sweden patients are practically frozen to 59F to facilitate heart surgery. Testing with dogs, the temperature was further lowered to 51F. Even temperatures down to 43F with humans are thought possible.

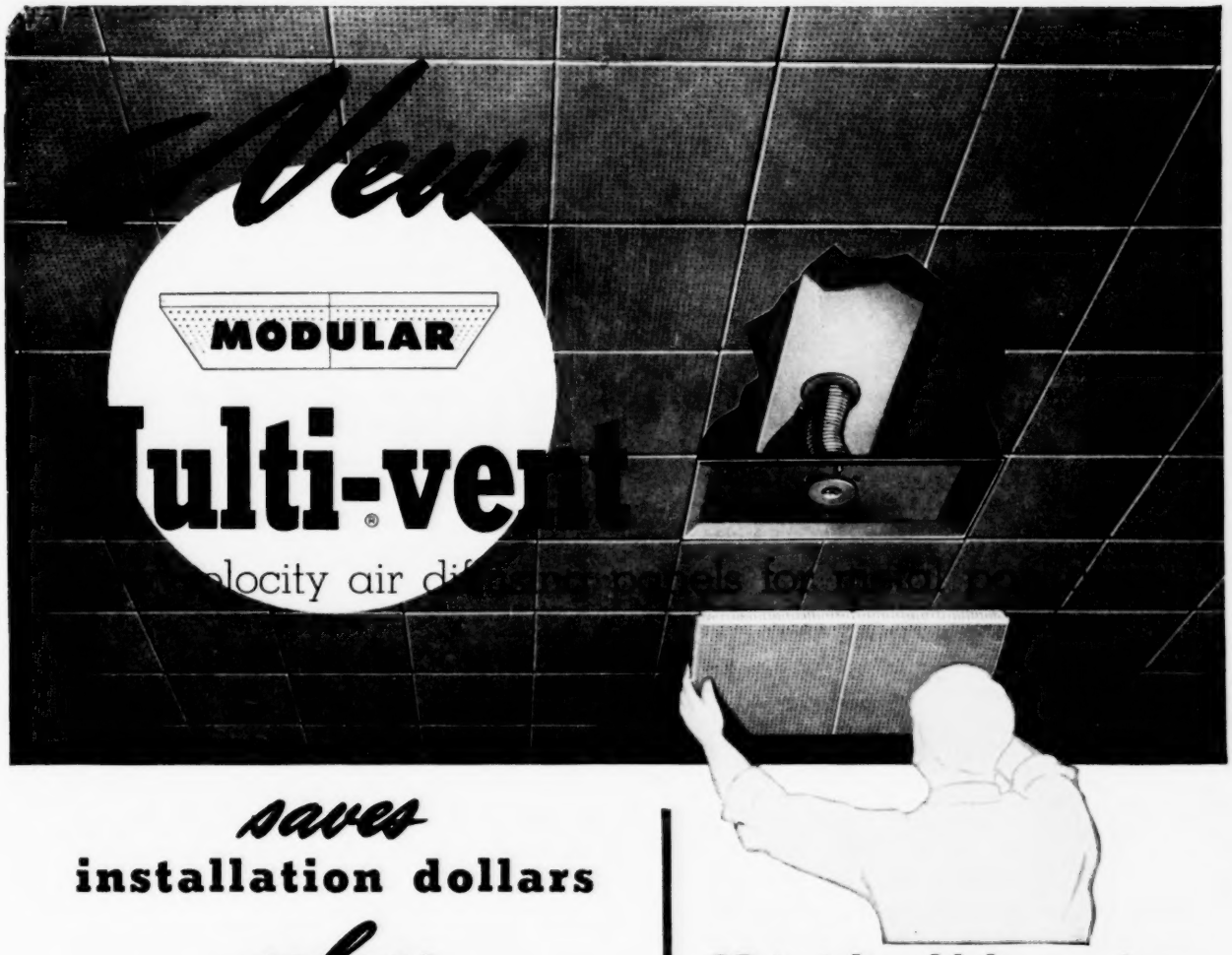
A steam generating plant in Italy, using natural gas as fuel, provides steam at 1,850 psig and 970F. Boilers are out in the open, condensing water is taken from an irrigating canal and the natural gas fuel is pre-expanded through a gas turbine to utilize the pressure drop prior to burning the gas in the boiler.

The Hell Gate Station of the Consolidated Edison Company utilizes a new idea for dust control. A dust removal unit recently installed at a cost of $200,000 consists of 64 hollow steel cones about 10 ft high. Gas enters the large end of a cone and leaves through 2,000 slotted perforations in the sides. Dust particles too heavy to make such sharp turns at slots, travel on to the narrow end of the cone where they are removed by vacuum ash collection. Smaller particles that pass through the slots in the sides are collected by an electrostatic precipitator.

The smoke-pipe to the residential chimney can be easily fitted with a small exterior quick acting draft fan. This fan is controlled so as to act instantaneously as heat is called for and is maintained by air injection through constant normal draft of predetermined intensity. Smoke-pipe and chimney are freed of dust and insufficient draft is eliminated as soon as the fan starts.

A kitchen sink has now been designed by a leading manufacturer to fit the middle of a kitchen. The housewife can work from any of its sides and save steps. A new type of faucet swings to any part of the sink. Dials control everything, even the starting of the garbage disposer.

A steel water tank was simply and easily dismantled by working with a gas torch from its inside. Men and equipment were floated on a raft the elevation of which was controlled by letting out some of the water whenever required. Interior and exterior scaffolding usually found necessary, was entirely avoided.



saves
installation dollars

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for the *OWNER* • *ARCHITECT* *ENGINEER* • *CONTRACTOR*

- Complete concealment.
- Panel locations determined solely by load considerations.
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- The highest loads and ventilating requirements handled with a total absence of strong air streams.
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Material and labor saving installation features

1—Shop built duct work installed and system balancing completed prior to and independent of ceiling erection.

2—No additional material, structural work, turndown collars or rigid connections requiring close fitting, sealing or calking are involved.

3—All components of Modular Multi-Vent panels are quickly and easily assembled, attached and aligned in the ceiling by hand without the use of tools. No cutting or reshaping of standard ceiling materials is necessary.

4—Existing air distribution systems can be readily and economically converted to Modular Multi-Vent.

Write for bulletin 385 with complete details and specification data.

MULTI-VENT DIVISION

THE PYLE-NATIONAL COMPANY
1374 North Kostner Ave., Chicago 51, Ill.

NEWS OF THE MONTH

ICE CREAM PLANT

built by Sealtest in Pittsburgh, Pa., features one floor level production area of 52,000 square feet.

A new ice cream plant, which has a capacity of 4,000,000 gallons per year, was finished in Pittsburgh last month by Rieck-McJunkin Dairy Company, making Sealtest ice cream. The design provides for all stages of ice cream production to be completed on one floor level. The building covers approximately 52,000 square feet, and is 254 feet long and 217 feet wide. Operational and sales offices are located in a partial second-floor. Compressors for refrigeration and air conditioning, boilers, pumps, and other mechanical equipment are located in the basement.

• **HARDENING ROOM.**—The plant's largest area is the hardening room, approximately 90 by 140 feet in size. This room will hold 125,000 gallons of ice cream, which will be one week's production in the summer's peak period.

The room's walls, ceiling, and floor are enclosed in a complete envelope of cork insulation eight inches thick and 30,000 square feet in area. The structural concrete floor, on which the insulated floor rests, is ventilated beneath to prevent freezing. The roof structure, of steel and concrete, is also enclosed within the cork envelope.

A battery of eight 15 hp blowers are used to refrigerate the hardening room. Each blower is connected to a duct supplying one row of 12 ceiling air diffusers. There are 96 five-foot air diffusers mounted on the ceiling of the room, holding the temperature in the room at a constant 20 degrees below zero by pouring refrigerated air into it.

• **TESTING.**—The heart of the plant's processing facilities is a completely equipped laboratory where quality of all ingredients is determined when they enter the plant and before they are used. Like all other rooms of the plant in which processing is carried out, the laboratory is air conditioned.

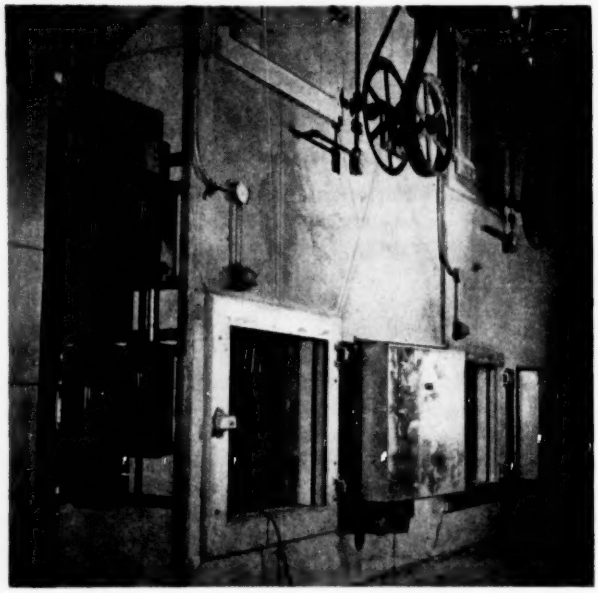


Fig. 1. Exterior of two 15-hp blowers. Part of an ammonia evaporator coil is visible through first blower's door.

Fig. 2. View of hardening room shows part of 96 five-foot air diffusers mounted on its ceiling. Each row of 12 diffusers is supplied by one of eight blowers which change air almost three times a minute. Temperature in room is 20 degrees below zero.

• **PROCESSING.**—All ice cream processing takes place in one big room with a total area of 10,000 square feet. Projecting through the tile wall on one side of this room are the large, polished stainless steel bulkheads of 13 storage tanks. Down the center of the room is a line of 13 freezers. Stainless steel mixing vats and pasteurizing equipment occupy one end of the room while the other end is taken up by a huge brine tank for freezing novelties.

• **OPERATIONS.**—In operation, milk and cream from storage tanks will be pumped into a covered weigh tank for proportioning. Then, the mixture will flow into a covered mixing vat, where the required amount of liquid sugar will be pumped into the vat. Flavoring may also be added at this stage. When the ingredients are thoroughly agitated, the mixture will be run through a preheater and into a homogenizer and from there into the high-temperature, short-time, (175F for 25 seconds) pasteurizer.

From the pasteurizer it will be pumped first over a cooler, which will again bring the temperature down to 34F, and then into a cold-wall mix storage tank where it will be held at that temperature until needed.

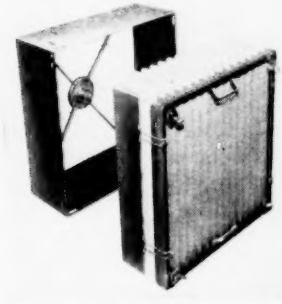
In the freezing operation the cool mix will be pumped from a storage tank directly to a freezer where it will be frozen to about 21F. It then goes into bulk paper cans, to a package filling machine, or into one of the novelty processing lines. Continuous conveyors carry the products from the filling machines directly into the hardening room where they are stacked.

(*Continued on page* 140)

Photographed by Torkel Korling

Architects: Skidmore, Owings & Merrill and E. C. Hooton *Mechanical Engineers:* Cary B. Gamble Associates
Mechanical Contractors: Emile A. Babst Company

It has been said of the Pan American Life Insurance building in New Orleans that: "it will rank with the best in the record of architecture of our time."



This is an ELECTRO-PL unit—the only electronic air cleaner with the "double indemnity" feature.

DOUBLE INDEMNITY

for Pan American Life with High Efficiency

Electro·PL FILTERS

Pan American Life Insurance Company's new home in New Orleans is an outstanding example of modern planning. Air, cleaned electronically, as well as conditioned and humidified, is a part of the ideal working atmosphere created for this recently completed office building.

AAF's ELECTRO-PL was selected as the air filtration equipment for several reasons including the important "double protection" feature. Here's how it works.

The ELECTRO-PL combines the advantages of higher efficiency with positive air cleaning. If, through a power failure, the electronic action should become inoperative, the air will continue to be filtered by one of the most efficient dry-type filtering media ever developed. A "double protection" feature offered by no other electronic cleaner.

Where modern planning calls for electronic air filtration look to AAF for the best in engineering and design. Call your nearby AAF representative for complete details on ELECTRO-PL . . . or write direct to us for Bulletin No. 257.

AAF

American Air Filter

COMPANY, INC.

294 Central Avenue, Louisville 8, Kentucky

American Air Filter of Canada, Ltd., Montreal, P. Q.

ICE CREAM PLANT

(*Continued from page* 138)

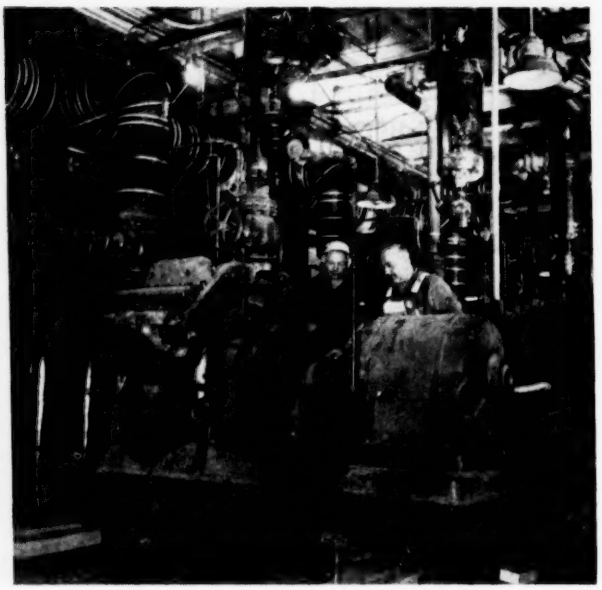


Fig. 3. Compressors which are used for refrigeration and air conditioning systems in the building are located in basement with all other mechanical equipment. Main floor is left free for straight line production in various processing rooms.

• **EQUIPMENT.**—Beneath the processing rooms is the basement area which houses the machinery. Here are controls for the electrical system which has a capacity of about 1,700 hp. Also in the basement is the compressor room for the plant's refrigeration system, which requires almost 1,200 hp, for chilling dairy products, freezing ice cream, and maintaining low temperatures in storage areas. The machinery for the air conditioning system requires 80 hp. Operation of the movement in the freezers requires 197 hp. The homogenizer requires 40 hp.

• **CREDITS.**—The new plant's architect was William C. Stohldrier, of White Plains, New York. The engineers were Krey and Hunt, of New York City. General contractor was Crump, Inc., of Pittsburgh. The principal sub-contractors were: York Corp., for processing refrigeration; Wayne Crouse, Inc., for heating, plumbing, processing piping, ventilating, and air conditioning; Fischbach and Moore, Inc., for electrical work; Harrison Construction Co., for foundations and piling; and Armstrong Cork Co., for insulation of the building and piping.

For Rieck-McJunkin, the general planning was under the direction of George M. Bracke, vice president in charge of ice cream production, and of William K. Niebaum, chief engineer and production supervisor.

• Appointment of Herbert F. Rothschild as executive assistant of Pyle-National Company was announced. In 1944 Mr. Rothschild started with Standard Packaging Corporation as controller and more recently was operations vice president. Previously he was associated with Malleable Iron Industry.

AIR POLLUTION CONTROL

is discussed from several different points of view by various authorities at a symposium held by ASME.

The scope of the field of air pollution, evaluation and measurement of pollution, uses of plants in studies on toxic effects, health aspects of the problem, diffusion in the atmosphere and stack design, the need for sampling and measuring code revisions, the legal aspects of the subject, and the education of the community on this topic, were points introduced and expanded upon by several authorities at a symposium on air pollution control held at the annual meeting of ASME.

• **SCOPE.**—Different meanings connoted by the term air pollution, and its effects from the viewpoint of nuisance, health, animals, vegetation and economics, along with the technic of measuring air pollution, the lack of an accepted uniform procedure for stack and community sampling, and the difficulties involved in an adequate evaluation of an air pollution problem were pointed out by Dr. Allen D. Brandt, chief industrial hygiene engineer of Bethlehem Steel Co.

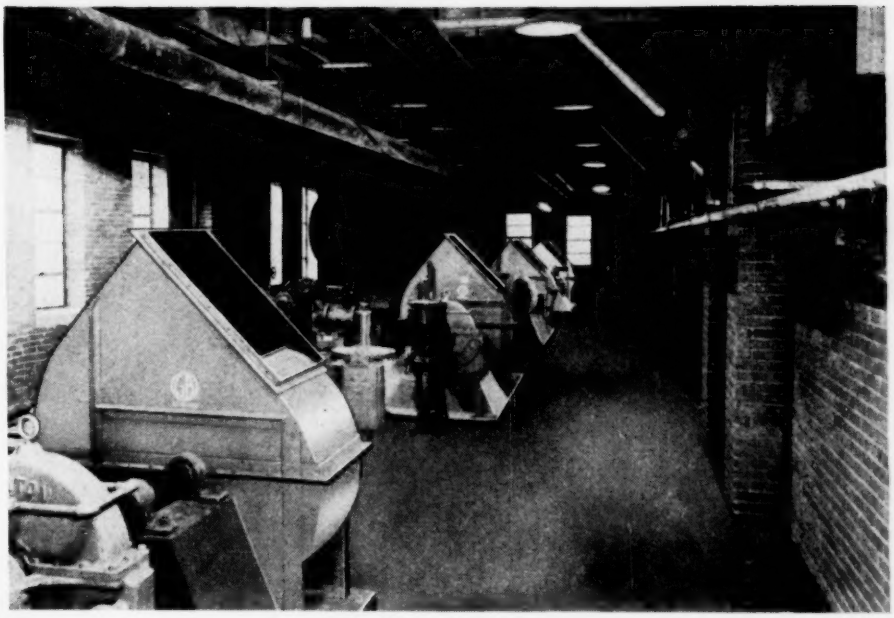
• **FINDINGS.**—Dr. Brandt discussed the concentrations of different pollutants found in different cities during the past three decades, and summarized the findings from the United States Public Health Service report on the Donora smog in 1948, which snuffed out a score of lives and made thousands ill. The importance of weather conditions and contours of the surrounding territory were emphasized. Also discussed were the principles covering control equipment for dust collection and cleaning of stack gases.

• **HEALTH.**—Dr. Robert A. Kehoe, director of the Kettering Laboratory, University of Cincinnati College of Medicine, and authority on poisoning from gases and fumes, discussed the health aspects of air pollution in detail, pointing out that knowledge gained through the Meuse Valley disaster in 1930 and the Donora smog of 1948 have enabled man to chart the means of avoiding similar disasters. He stated that facts gained from the study of industrial gases and fumes have enabled comparisons to be made regarding the average concentrations of air pollution over cities which indicate that, under ordinary conditions, gases and fumes do not occur in amounts sufficient to justify apprehension as to their effects upon health. Further study upon these problems is essential, especially to determine the effects of combinations of gases and fumes.

• **PLANT USES.**—On the other hand, many air pollutants around large cities and industrial areas are toxic to plants if the concentration is great enough and the exposure long enough, it was claimed by Dr. P. W. Zimmerman of the Boyce Thompson Institute of Yonkers. This authority on plant pathology stated that it was often possible to identify air impurities by their effects upon susceptible foliage and other vegetation. The complex mixtures occurring in smog, however, are difficult to study and require additional investigation.

• **DIFFUSION.**—The importance of diffusion by atmospheric turbulence and the use of tall chimneys and high stack temperatures to reduce pollution were emphasized

(*Continued on page* 144)



Shown on the right is a GENERAL BLOWER installation of forced draft fans for the Middletown State Hospital.

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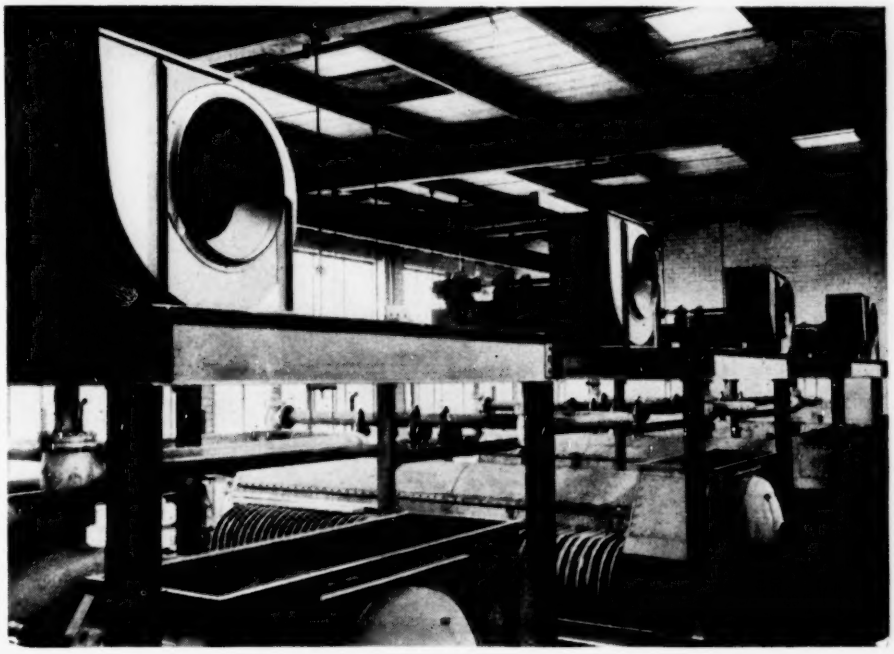

Shown on the right is a GENERAL BLOWER installation of induced draft fans for the Long Island Agricultural and Technical Institute at Farmingdale, Long Island.

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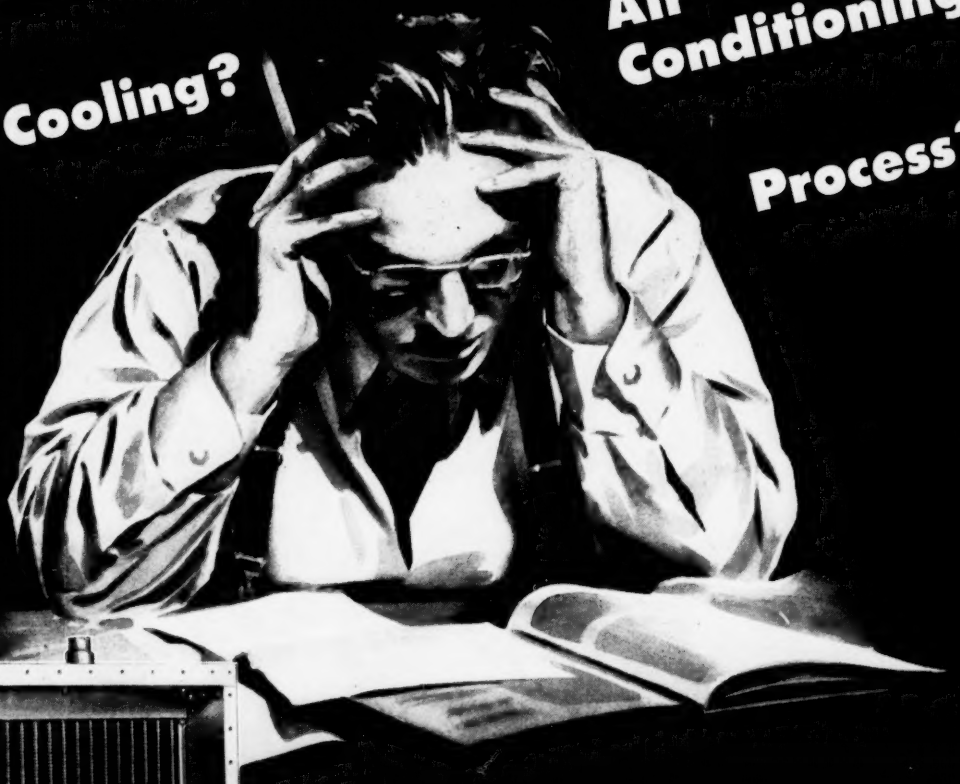

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- **New Catalogs**

Circle the item Numbers in which you are interested and print clearly your name and address with title.

NEW CATALOGS

FINNED-TUBE RADIATION

A new 28-page catalog, No. 625, describing its Linovector commercial radiation is now available from The Vulcan Radiator Co., Hartford, Conn. It includes instructions for laying out all types of commercial installations of fin-tube radiation. It presents for the architect, engineer and contractor comprehensive pipe sizing tables for hot water or steam heating systems including series loop; also dimensional data on enclosures, hangers, support brackets, joining pieces and manually operated dampers for the company's product. ..... **Item 34**

CARBON MONOXIDE DETECTOR

Bulletin 201, a 10-page booklet covering its carbon monoxide detector for utilities, tunnels, garages, mines and industrial plants is offered by Taller & Cooper, Inc., Brooklyn, N. Y. With the use of illustrations and diagrams it explains the function, operation, components and applications of the unit along with complete specifications. Units already installed are pictured. .. **Item 35**

VALVES AND AIR ELIMINATORS

Bulletins No. 117 and 118 on its line of vapor equalizing valves and air eliminators are issued by Gorton Heating Corp., Cranford, N. J. No. 117 describes valves for vaporizing and equalizing in steam heating systems for use on mains and unit heaters. No. 118 describes valves for quick venting on steam heating systems with concealed radiators, mains, and unit heaters. ..... **Item 36**

AIR CONDITIONING PRODUCTS

An illustrated booklet showing and describing its line of air conditioning products is an introductory release of Airtemp Div., Chrysler Corp., Dayton, Ohio. A short description of its plant, with pictures, is included..... **Item 37**

SMALL VERTICAL PUMPS

Bulletin 52B6975A on its line of small vertical pumps is available from Allis-Chalmers Mfg. Co., Milwaukee, Wis. Construction features of the pumps for sidewall or submerged mounting are described in the 8-page booklet. Units covered are available in capacities to 250 gallons per minute at heads to 125 feet for coolant circulating and air conditioning. Curves and tables to determine motor frame, horsepower, speed and current characteristics for the various units are included in the bulletin. Also given are construction details of shaft seals and motors. ..... **Item 38**

DUST COLLECTION EQUIPMENT

A paper on Operation, Application and Effectiveness of Dust Collection Equipment, originally published in Heating and Ventilating, is reprinted by the American Air Filter Co., Louisville, Ky. It contains charts on costs of dust collecting equipment; range of particle sizes, concentrations and collector performances; drawings of different types of dust collectors; list of practical Don'ts; and data on the selection, installation and operation of dust collection equipment. ... **Item 39**

UNIT HEATER MANUAL

A 36-page manual No. 2395 on blower type unit heaters is published by C. A. Dunham Co., Chicago, Ill. This bulletin, which supplements the Dunham Heating Products Catalog, is designed for service as a handbook for those interested in the specification, sale and installation of the heaters. It provides the "do's" and "don'ts" for selecting and applying blower type units. Complete with diagrams, drawings, illustrations and charts, the manual is divided into three sections, General Description, Selection, and Application. ..... **Item 40**

WATER HEATERS AND COOLERS

An eight-page brochure on water heaters and coolers is issued by Manning & Lewis Eng. Co., Newark, N. J. It consists of illustrations and line drawings covering a cross section of these products. Accompanying diagrams on every page show how each individual unit functions. Also of value to any purchaser of coolers or heaters are the various tables dealing with heater selection, sizes, capacities and dimensions. ..... **Item 41**

ELECTRIC HEATING ELEMENTS

Application of Calrod heaters by equipment manufacturers is described in fourteen case histories in a bulletin available from General Electric Co., Schenectady, N. Y. Designated as GEA-5866, the 16-page, two-color bulletin employs 50 photos to tell how original equipment manufacturers have made new or improved machines using built-in electric heat from Calrod heaters. The case histories are grouped by heating surfaces, melting soft metals, radiant heat, heating liquids, and heating process air. ..... **Item 42**

WINCH-HOISTS AND ACCESSORIES

A 4-page folder, No. 240, on its three new models of winch-hoists, and its line of accessories, is distributed by The Lug-All Co., Wynnewood, Pa. The folder catalogs, describes, and illustrates each item, as well as giving diagrams of their applications which include installing metal ducts; lifting air conditioning or heating units; lowering equipment down skids; installing tanks and furnaces; lifting pipes, cylinders, radiators, and boilers. ..... **Item 43**

BASEBOARD RADIATION

Two types of National Art baseboard, Type BF for installation against plaster and type BR for semi-recessed installation, are described and illustrated in Catalog No. 598, now available from The National Radiator Co., Johnstown, Pa. The catalog gives roughing-in dimensions, pictures of baseboard installations, illustrations of trim items such as splicer plates and inside and outside corners, plus complete rating data. ... **Item 44**

AIR FILTER FOLDER

A 5-page folder on its washable air filter is issued by H. J. Somers, Inc., Detroit, Mich. The pamphlet describes, illustrates and diagrams the types of air filters offered, giving their composition and design. Data on stock sizes and capacities are given for one type, and specifications are given for all types. **Item 45**

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FLEXIBLE TUBING CATALOG

Catalog C 2-4, an 8-page bulletin describing flexible tubing for ventilation, fume and dust removal, and materials handling, is available from Flexible Tubing Corp., Guilford, Conn. The catalog gives detailed information on Spiratube A and Spiratube R, two types of flexible lightweight tubing made from continuous helical coils of spring wire wound with overlapping plies of specially-treated multi-coated fabric. Spiratube A is designed for ventilation, dust removal, fume disposal, and similar applications, either blowing or exhausting. Spiratube R, with built-up extra thickness of rubber, Neoprene, or other polymers, is designed for materials handling, current installations carrying such products as hay, carbon black, sugar, cotton, dry cement, flour, and granulated chemicals. The catalog also describes Flexflyte, smaller-diameter tubing for the same uses as Spiratube. It contains detailed specifications, air friction charts, data on oil and chemical resistance, and application information. ..... **Item 46**

GAS-OIL BURNERS

A 4-page folder, catalog No. 52-CU-1, describing its gas burner unit which will burn oil for an auxiliary fuel, is distributed by The Sonner Burner Co., Winfield, Kansas. The advantages of the unit are outlined, and the gas and oil burner sections are explained and illustrated. Tables are included listing complete specification, capacity, and installation data. The unit is also shown in a detailed drawing. ..... **Item 47**

CORROSION-PROOF MATERIAL

Bulletin 9-1, covering its Ampcoflex rigid polyvinyl chloride self-supporting material for construction, is issued by The Atlas Mineral Products Co., Mertztown, Pa. The booklet contains descriptions of the product, its composition, and its applications, such as exhaust systems, tanks and tank liners, process equipment, dipping baskets, and duct and venting equipment. Included are illustrations of the latter, and tables of physical properties and resistance characteristics. Reprints of articles and reference sheets on the material are also contained in the bulletin. ..... **Item 48**

WATER SYSTEMS CATALOG

Catalog No. 210, a 52-page bulletin containing views of complete pumps and water systems, details of pump construction with sectional views, selection tables, charts of water requirements, and pipe friction tables, is available from Flint & Walling Mfg. Co., Inc., Kendallville, Ind. The complete line of its pumps now in production is shown in detail with descriptive data, capacities and specifications. Several new models are included to round out the line of shallow and deep well pumps. ..... **Item 49**

COOLING TOWER BULLETIN

Bulletin 33-104, giving information about its 1953 line of Series 33 cooling towers, is released by Havens Structural Steel Co., Kansas City, Mo. Addition of 2, 3, and 5 ton capacity units of welded design to its line is noted. A cross-sectional descriptive view of the typical unit is presented along with specifications, features and advantages, dimensional data, application data, and a base price list. ..... **Item 50**

HOSPITAL PLANNING MANUAL

A new manual of plumbing fixtures for hospital planning, designed to help hospital administrators, architects, engineers, and plumbers in the selection of plumbing fixtures and fittings for modern hospitals, is published by Hospital Products Div., American Radiator and Standard Sanitary Corp., Pittsburgh, Pa. Divided into two main parts, Sections A and B, the book includes in the first section floor plans of the different departments of a typical hospital. Developed by the U. S. Public Health Service as a guide for efficient hospital planning, the floor plans indicate the fixture requirements of the individual hospital departments. Section B shows various plumbing fixtures like lavatories, special hospital-type sinks, baths, water closets, and therapeutic equipment in a wide variety of units. A full description is included with each fixture and fitting, giving the sizes available, type of support, and other pertinent information. ..... **Item 51**

TOILET & SHOWER COMPARTMENTS

Detailed engineering information and specifications on toilet compartments, shower stalls and hospital cubicles are provided in Catalog 90, which is issued by The Sanymetal Products Co., Inc., Cleveland, Ohio. This 20-page catalog gives a selection chart of types of compartments and stalls in both ceiling-hung and floor-supported types. A color chart with color chips provides selection of twenty-two colors, in either vitreous porcelain on steel or synthetic enamel baked over bonderized steel. ..... **Item 52**

HEAT TRANSFER EQUIPMENT

A new catalog of heat transfer equipment for refrigeration and air conditioning applications is released by Standard Refrigeration Co., Chicago, Ill. This new manual, complete with illustrations and useful tables, covers cleanable and counterflow condensers, both shell-and-coil and shell-and-tube; liquid receivers; stainless steel evaporators; and adjustable capillary valves. ..... **Item 53**

BOILER-BURNER UNITS

A 14-page catalog, Form No. 2314, describing boiler-burner units for high or low pressure heating, power, and process steam, is distributed by the joint manufacturers, Iron Fireman Mfg. Co., Cleveland, Ohio, and Kewanee-Ross Corp., Kewanee, Ill. It contains full description and complete data on the entire line of units. Many illustrations, including cross-sectional color diagrams showing operation, help in selection of proper units in each application. Specification tables are also given. ..... **Item 54**

COLOR FILM ON STEAM TRAPPING

A new 20-minute color and sound motion picture, Please Pass the Condensate, on up-to-date steam trapping for more production, has been prepared by Yarnall-Waring Co., Philadelphia, Pa. It portrays the operation, selection, application, and maintenance of steam traps, all with the aim of getting more production from steam heated equipment through reduced heat-up time and hotter operating temperature, as well as shortened time for repairs and cleaning. Produced by DeFrenes Co., Philadelphia, Pa., it is available for showing to engineering and plant groups. ..... **Item 55**

GENERAL PURPOSE PUMPS

Construction features of its supporting-adapter type, close-coupled general purpose pump in capacities to 2500 gpm at heads to 550 feet are described and shown in Bulletin 5286083A which is now released by Allis-Chalmers Mfg. Co., Milwaukee, Wis. Alternate sealing arrangements available are diagramed in the bulletin and a table of dimensions is given. ..... **Item 56**

DEMINERALIZATION

Bulletin 3803, Demineralization including Silica Removal by Ion Exchange, designed to help explain one of the newer roles that ion exchangers are playing in industry, is distributed by The Permutit Co., New York, N. Y. This 28-page bulletin describes the chief applications, principles of operation, design features, advantages, recommendations and specifications of its demineralizing and silica removal apparatus and synthetic resins. ..... **Item 57**

FIRM ACTIVITIES AND PRODUCTION

A 22-page booklet, The Norris-Thermador Story, describing the sales, production, and office activities and detailing the manufacture of its various products, which include plumbing ware, utensils, automobile wheels, compressed gas cylinders, electric ranges, heaters, evaporative coolers, water heaters, transformers, and motors, is offered by Norris-Thermador Corp., Los Angeles, Calif. The booklet is profusely illustrated. .... **Item 58**

TUBES AND FITTINGS

Bulletin 103-Z on its line of steel and stainless steel tubes and stainless and carbon steel welded fittings is released by Globe Steel Tubes Co., Milwaukee, Wis. The 12-page catalog contains material on the applications of each item, also giving properties of the various types. Illustrations of tubes and fittings included. ..... **Item 59**

PLEASE SEND US MORE INFORMATION. Circle below item numbers on which you wish further information.

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PLEASE PRINT Feb. H-53

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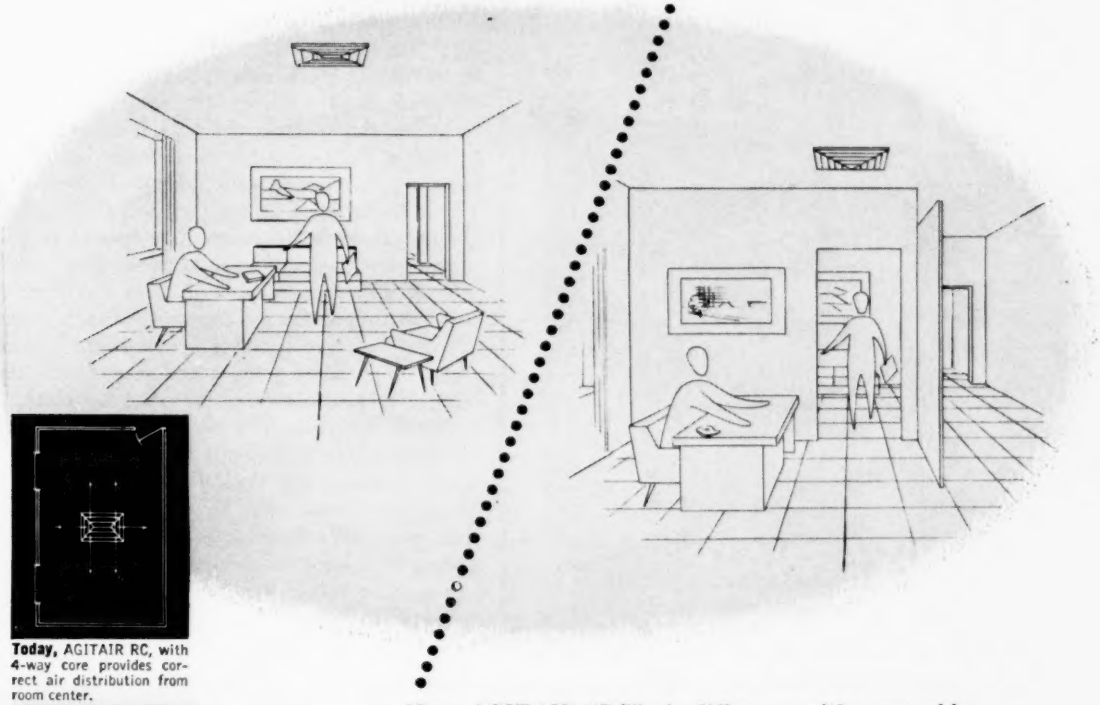
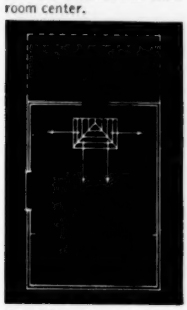
How to be years ahead...over head



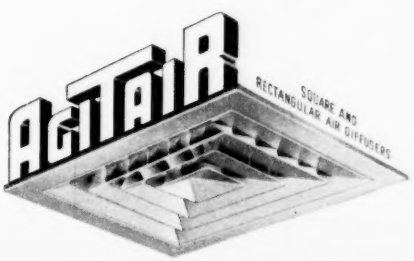
Today, AGITAIR RC, with 4-way core provides correct air distribution from room center.



Tomorrow, with walls moved and partitions added, a 3-way AGITAIR core assures correct air distribution from side of room.

Now, AGITAIR "RC" air diffusers—with removable, interchangeable cores—enable you to plan for today and be prepared for tomorrow. Mounting frames are permanent, attractive . . . come in three distinct styles to meet all job conditions. Exclusive AGITAIR features include patented, built-in diffusing vanes and unlimited pattern possibilities . . . giving 100% control of volume and direction of discharge in areas of any size or shape. Installation is quick, simple. Merely attach mounting frame to duct. Then insert diffuser core and lock into position. Whether you are an architect, engineer or contractor, you will want the latest technical data on the new AGITAIR "RC" diffuser. Contact your local AGITAIR representative, or write us today.

The vanes make the difference



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TYPE RCDF . . . For Drop Frame Installations

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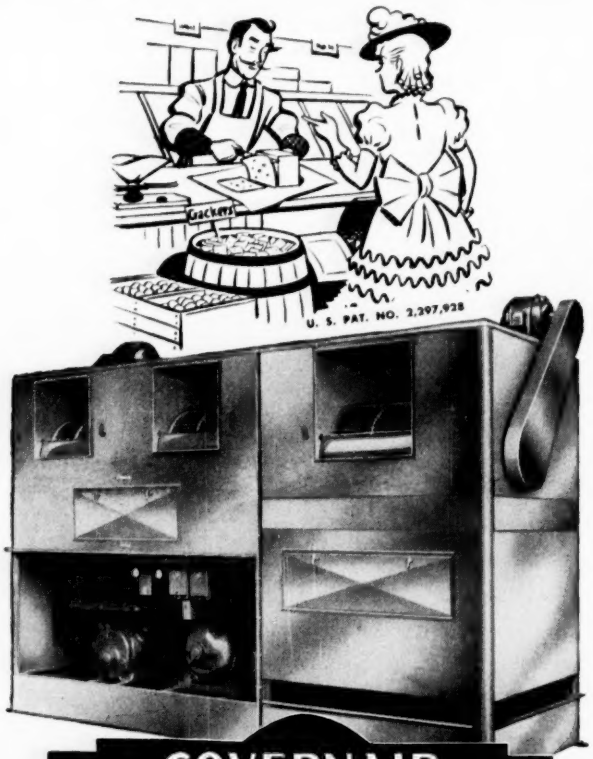

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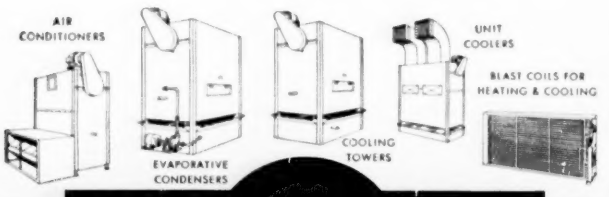
That's why *so many* Governair Completely Packaged Air Conditioners are in use today. They are engineered and built by the pioneers of large size packaged air conditioning — *Governair!*

If you want a package deal that will do a better job of air conditioning for you choose Governair! Sized from 3 to 60 tons. GOVERNAIR CORPORATION, 513 N. Blackwelder, Oklahoma City, Okla.



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ORIGINATORS OF COMPLETELY PACKAGED AIR CONDITIONERS!

AIR POLLUTION CONTROL

(*Continued from page* 140)

by Professor E. Wendell Hewson of the Massachusetts Institute of Technology. Both climate and terrain should be considered when construction of new industrial plants is contemplated. Useful in this planning are wind tunnel studies such as those being currently carried on at New York University.

• **MEASUREMENTS.**—Sampling and measurement of air pollution is a complex technical task requiring new technics, stated Dr. Leslie Silverman of the Harvard School of Public Health. He pointed out that the ASME code on dust separators described several devices by which stacks could be sampled for gases and dust. These methods must be augmented by special technics for the wide variety of air contaminants now holding public interest. Filters for capturing dusts and fumes, which enable investigators to capture particles smaller than 1/25,000 of an inch, are now available. For sampling hot gases which destroy most ordinary filters, the Harvard laboratory has fabricated special glass cloth.

• **LEGAL POINTS.**—The legal aspects of air pollution abatement were considered by Frank L. Seamans, Pittsburgh attorney, who pointed out that any workable legislation must provide for the utilization of technical knowledge and must encourage industry to assume the real responsibility. Industry should not wait for restrictive legislation to be forced upon it, but must acquire a special knowledge which will enable it to take the lead.

• **PUBLIC EDUCATION.**—Education of the public on air pollution problems by every means to bring about harmony between industry and surrounding communities was the theme of a discussion by George F. Jenkins, Carbide and Carbon Chemicals Co., South Charleston, W. Va. That management and its engineering talent is not only aware of these problems, but is honestly doing something about it, is not enough; the public must be made thoroughly acquainted with it. Mr. Jenkins quoted from the statements of many top executives in American business which indicate that this is being done, but in too limited a manner for complete satisfaction.

HEAT-CAPACITY STANDARDS

are developed to take the place of water when needed for measurement at extreme temperatures.

With the extension of heat measurements toward the extremes of the temperature scale, the National Bureau of Standards is developing new standards of heat capacity for use at temperatures where water, the present standard substance, cannot conveniently be employed. Special samples of three materials, benzoic acid, *n*-heptane, and aluminum oxide, have already been prepared and their heat capacities determined over most of the useful temperature range. A limited number of these samples are being made available to laboratories equipped to make very precise measurements of heat capacity.

(*Continued on page* 146)

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● Best business-booster we know is the good will that comes when you show your customers a worth-while saving. So specify Dorex Air Recovery on your air cooling and heating jobs. As an example of what this can mean —

One of America's great manufacturing plants has already saved over $40,000 on the cost of boilers and other equipment by making Dorex Air Recovery part of its heating system . . . and estimates further savings of about 2,500 tons of coal a year.

Dorex Air Recovery "manufactures" *fresh* air by passing *used* air through specially activated carbon that removes all odorous and gaseous impurities. This reduces by about two-thirds the amount of outside air that has to be taken into the system. That's why less heating and cooling equipment is needed, why operating costs are sure to be lower.

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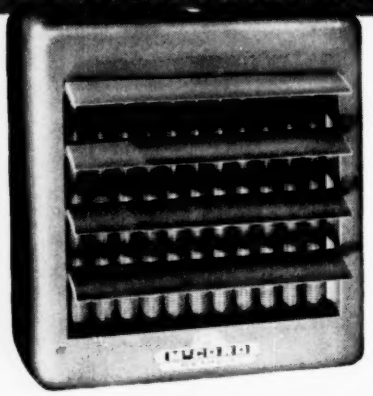
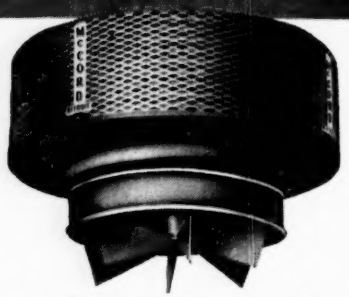
HEATING AND AIR CONDITIONING PRODUCTS

HORIZONTAL TYPE UNIT HEATERS



Modern design—top performance—thousands in use—dependable heat. All copper coils to resist corrosion — individual tube expansion — most rugged construction — quiet operation — easy installation—standard motors with standard bases. Sizes to 272,000 B.T.U. capacity.

VERTICAL TYPE UNIT HEATERS



A proven heating unit—all copper coils to resist corrosion. McCord spiral tube fin construction creates air turbulence without undue restriction. Improved fan delivers large volume of air, with minimum air noise. All McCord heaters are guaranteed for use with 150 lbs. saturated steam pressure. Sizes to 575,000 B.T.U. capacity.

McCORD CORPORATION
DETROIT 11, MICH.

HEAT-CAPACITY STANDARDS

(*Continued from page* 146)

• **PROBLEMS.**— Because water is universally available in high purity, it has been used as a standard for heat-capacity measurements since the early development of calorimetry. However, recent developments in such fields as low-temperature physics, nuclear engineering, and jet propulsion have made it necessary to extend heat measurements to both very high and very low temperatures. Although water has served admirably as a heat-capacity standard in the range from 32F to 212F, it is not well suited to use outside this range. Below 32F its large expansion on freezing makes it too hazardous for many calorimeters, while above 212F its increasing vapor pressure usually makes it impractical for use.

• **PROPOSAL.**—A fifth material, diphenyl ether, has been suggested as a heat-capacity standard. Advantages of this substance are its chemical inertness, relatively high boiling point, and ease of purification. A very pure sample of diphenyl ether has recently been prepared at NBS by fractional crystallization, and its heat capacity has been measured up to 572F.

• **EXPECTATIONS.**—In the past there has been considerable discrepancy between calorimetric results obtained by various investigators using different types of apparatus, particularly at high temperatures. It is hoped that the heat-capacity standards under development at NBS will provide a means of comparing measurements made in different laboratories under different experimental conditions. Such standards should also make it possible for workers in calorimetry to check the absolute accuracy of their results over a much broader temperature range than heretofore and to accurately calibrate their apparatus in the absence of other, more elaborate means of calibration.

ARCHITECTURAL COMPETITION

to offer 31 awards totalling $27,800 for homes designed around air conditioning. Grand prize is $5,000.

Carrier Corporation is conducting a nation-wide architectural competition to obtain designs for homes planned around air conditioning and providing prizes totalling $27,800. The Weathermaker Home Competition offers 31 prizes, including a national grand prize of $5,000, plus six prizes of $2,000 each distributed in three geographic regions, and eight additional prizes for each region. The contest opens February 2 and closes April 10.

• **RULES.**—The regional grand prizes will be offered in two size categories, houses up to 1,000 square feet in area, and up to 1,800 square feet in area. Awards will also be made for both pitched roof and flat roof houses in both size categories. Although prizes will be awarded in the two size classes, no limitation will be placed on number of rooms or floors or the type, period, or style of the house. The contest is open to registered architects and architectural draftsmen and students.

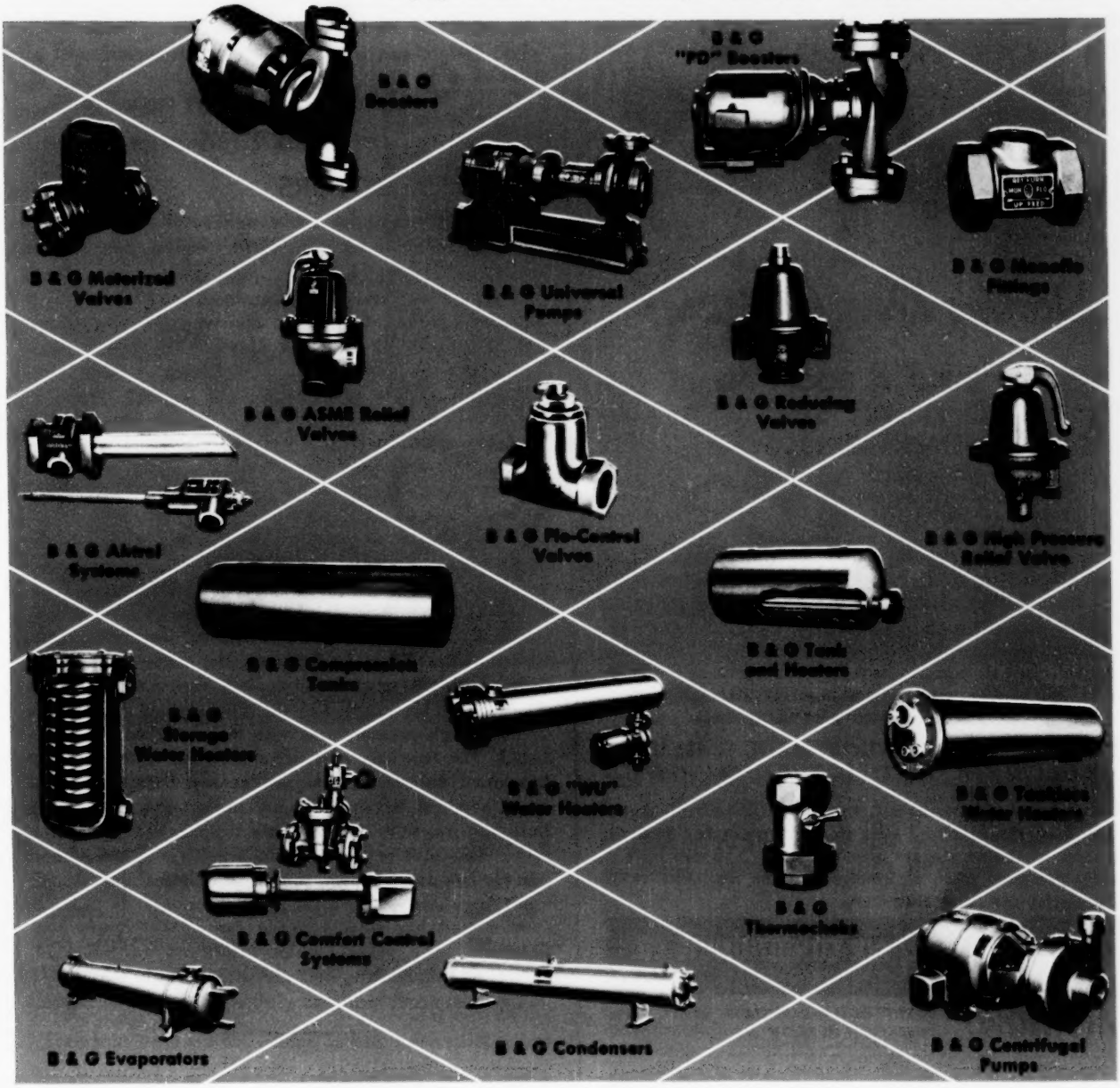
• **JUDGING.**—Entries will be judged on esthetic consid-

(*Continued on page* 148)

Look for this symbol of quality

Hydro-Flo* PRODUCTS

Forced hot water heating systems . . . service water heating systems . . . refrigeration and air conditioning equipment . . . centrifugal pumps . . . heat exchangers


B & G Boosters
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B & G Flo-Control Valves
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B & G Storage Water Heaters
B & G "WU" Water Heaters
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Send for this catalog of B & G *Hydro-Flo* Heating Products

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Deering Does It Again!

FIRST TO BUILD A ROOM AIR CONDITIONER TO FIT ALL STEEL AND ALUMINUM CASEMENT WINDOWS

Now we built another air conditioner that can be installed in just one window opening as small as 10¼" high and 14½" wide. Consumer demands by those owning casement windows had to be met for an air conditioner that would eliminate costly window modifications. Here it is! And so easy to install, in less than 30 minutes by either service man or customer. It requires no special framing, window brackets or wing adapters — no installation kit needed. Just slide-in . . . hook-in and plug-in, as simple as that. No window mullions and muntins altered, mutilated or destroyed, no drilling, cutting or filing.

THERE IS NOT A WINDOW MADE (CASEMENT OR DOUBLE HUNG) THAT THE DEERING WILL NOT FIT.

Think of the increased sales this will mean for you, no matter what line you are now carrying. You can have a truly complete room air conditioner line that will mean more sales and more customers.

The Deering AIR CONDITIONING CO.
CINCINNATI 2, OHIO

ACT NOW! PROFIT IN 1953 FROM A BRAND NEW DIMENSION IN ROOM AIR CONDITIONING

Yes! I am interested in a franchise for the DEERING casement window room air conditioner. Please rush me full information.

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Position_____
City_____ Zone____ State_____

MAIL TODAY TO
THE DEERING AIR CONDITIONING COMPANY
1069 CELESTIAL AVENUE • CINCINNATI 2, OHIO

ARCHITECTURAL COMPETITION

(*Continued from page* 146)

erations and on suitability and adaptability for use in a home builder's development. Particular stress will be given to good planning for house and site, taking advantage of year-round air conditioning. Another important consideration will be skill in achieving economies in plan, design, and equipment due to the inclusion of air conditioning.

CANNED MOTORS

driving pumps for a nuclear reactor have rotor and stator contained in shrink-fit stainless steel jackets.

Motors driving hot-water circulating pumps for a nuclear reactor, are, literally, canned, according to Westinghouse Electric Corp. The squirrel-cage rotor is contained in a shrink-fit jacket of steel. It turns within a stator that likewise is fully enclosed in stainless steel. In this type of a motor, the term air gap cannot be used, as it is actually a combination of water and two layers of metal. Both the stator and the rotor are encased in stainless steel, and the space between is filled with flowing hot water; the same fluid that is being pumped through the reactor circuit.

As with most of the components of the reactor circuit, leakage must be small. Hence the motors cannot drive the pumps through seals. The rotor must be contained within the fluid circuit and obviously is continuously exposed to water that is hot both as to temperature and radioactivity. To prove tightness, the stator enclosure is tested with the most sensitive leak detector obtainable. The space to be occupied by the rotor is filled with helium under a high pressure and with the stator volume evacuated. The bearings also are inside the stator and are lubricated by water. The motors are built in several sizes, and the whole packaged unit, motor and pump built integral with it, must pass the Navy test for high shock. One unit is presently undergoing shock tests and has to date survived five blows of relatively severe intensity without any visible or operational damage. A smaller unit has been running for 13,000 hours continuously (1½ years) under conditions of full load, operating temperature, and pressure.

SERVICE MANAGER CLUB

formed by RSES at Miami, Fla. meeting; designed to benefit industry by cooperation of manufacturers.

A Service Manager Club was formed by the Refrigeration Service Engineers Society at a meeting held December 6, at the Biscayne Terrace Hotel in Miami, Fla. Membership in this Club is limited to National Service Managers of manufacturers of refrigeration and air-conditioning equipment, accessories, and auxiliaries.

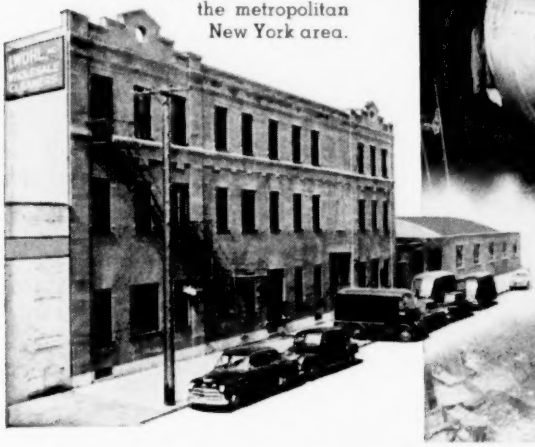
(*Continued on page* 150)

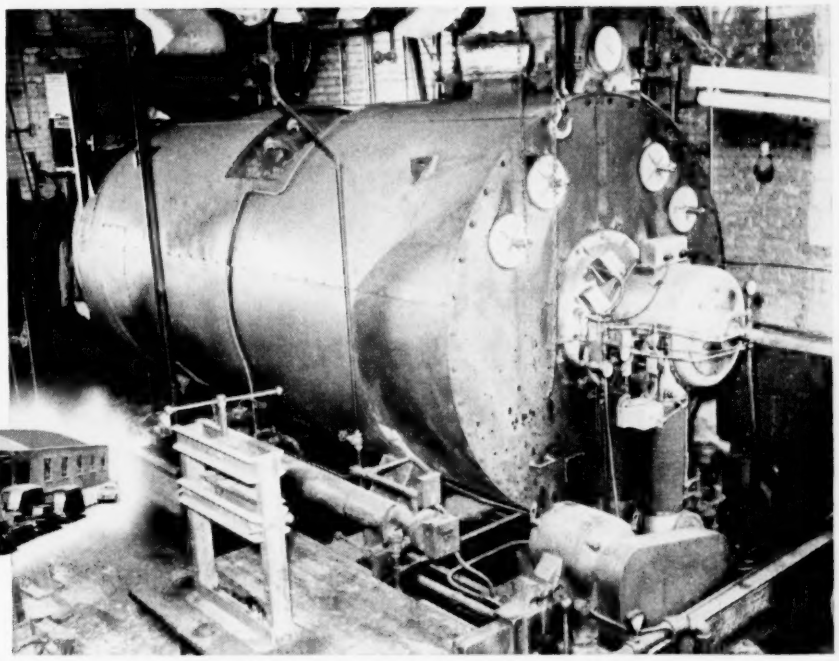
Powermaster®

CUTS STEAM COSTS ⅓

at large New York cleaning plant

I. WOHL, INC., Long Island City, N. Y., is one of the largest wholesale dry cleaning firms in the metropolitan New York area.





The 300 h.p. Orr & Sembower POWERMASTER boiler generates dry steam at 100 psi for drying, pressing, spotting, heating wash water, and for winter comfort heating. No. 6 Bunker C residual fuel oil is burned automatically.

● Here's what Henry Falkenberry, Chief Engineer at Wohl, has to say:

"The operating personnel are enthusiastic about the Orr & Sembower boiler. It is well liked by everyone principally because of its fully automatic operation and minimum attention that is required. The automatic operating controls keep the steam pressure constant even with widely varying steam demands.

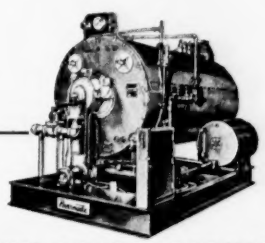
"Freedom from maintenance is another outstanding advantage to us. Cleaning is done once every six months and we feel this could be cut to once a year. The old boiler had to be thoroughly cleaned every week. Furthermore, there has been no work interruption or trouble of any kind encountered over the past two full years of 24-hour-a-day operation."

Before deciding on a boiler for your plant, be sure to get the facts on the newest POWERMASTER with VORIFLOW combustion. Write for this catalog that gives you the entire story of the *Powermaster* packaged automatic boiler. Just drop us a line and we'll put one in the mail for you.

Powermaster®

PACKAGED AUTOMATIC BOILERS

In sizes to 500 h.p.; pressures to 250 psi.



ORR & SEMBOWER, INC. • *Established 1885* • 980 MORGANTOWN ROAD, READING, PA.

greater efficiency for

Commercial and Industrial

GAS

fired heating plants with

field

"M-G" draft controls

1. Double acting gate opens inward to regulate up-drafts and outward to relieve down-drafts.
2. Adding or taking off weights provide simple adjustment for up-draft conditions at time of installation.
3. Control will relieve internal or down-draft pressures of only a few thousandths of an inch.
4. Weights attached to gate itself are factory set to insure extreme sensitivity to down-draft conditions.
5. Corrosion resistant knife edge bearings resting on self-aligning bearing plates assure extreme sensitivity yet long life.
6. Side wings improve the regulation, making the control accurate at all gate positions.
7. Long collar keeps gate out of the path of flue gases—resulting in greatly increased life.

Now there is a Field Draft Control to provide for commercial gas-fired heating plants the same accurate, dependable, fuel-saving performance that has made Field first choice for oil and coal furnaces. The new Field "M-G" for gas is fully proven, widely accepted, fully safe — a control specially designed for gas but retaining all outstanding design features of the Field Type M Control. Write today for complete information.

FIELD CONTROL DIVISION

of H. D. Conkey & Company — Mendota, Illinois

AFFILIATES: Conco Building Products, Inc.—Brick, Tile, Stone
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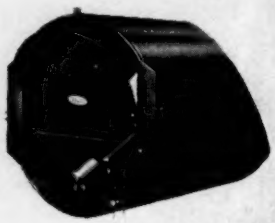
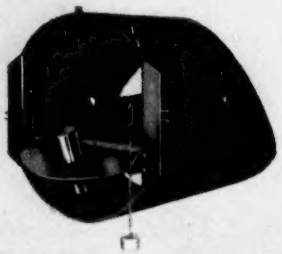
UP-DRAFT VIEW

Gate opens inward to regulate updrafts in conventional, proven manner, checking any excess in draft.





DOWN-DRAFT VIEW

Gate opens outward to relieve down drafts which might affect flame. An optional safety switch closes main gas valve in case of prolonged down draft, thus providing full protection.

SERVICE MANAGER CLUB

(*Continued from page* 148)

• **FAVORABLE RESPONSE.**—A Service Manager Club was suggested by Paul Reed, International Educational Director of RSES. So many service managers responded so favorably and even enthusiastically, that a preliminary meeting was held in Miami in conjunction with the Annual International Convention of RSES and the RSES-REMA jointly sponsored Educational Exhibit and Conference.

• **COMMITTEE.**—At the Miami meeting, a temporary Executive Committee was elected to direct the affairs of the club. This committee consists of E. C. Hamilton, manager, Distributor Service Dept., Air Conditioning and Refrigeration Div., Worthington Corp., as Chairman; John M. Spence, service manager of Hussmann Refrigeration, Inc.; and George S. Eager, service manager, Electric Refrigeration Div., Servel, Inc.

• **RESULTS.**—Discussion brought out that although products of the manufacturers vary, many of their service problems are identical; and that the service managers, their employers, service engineers, and users can benefit by cooperation at the top level of service executives of the industry.

A draft of suggested by-laws was read and discussed, and some modifications made. A few possible projects for future activities of the club were suggested. Mr. Reed reported that the club then numbered 55 members, with additional applications continuing to be received.

GETTING PERSONAL

J. Askin

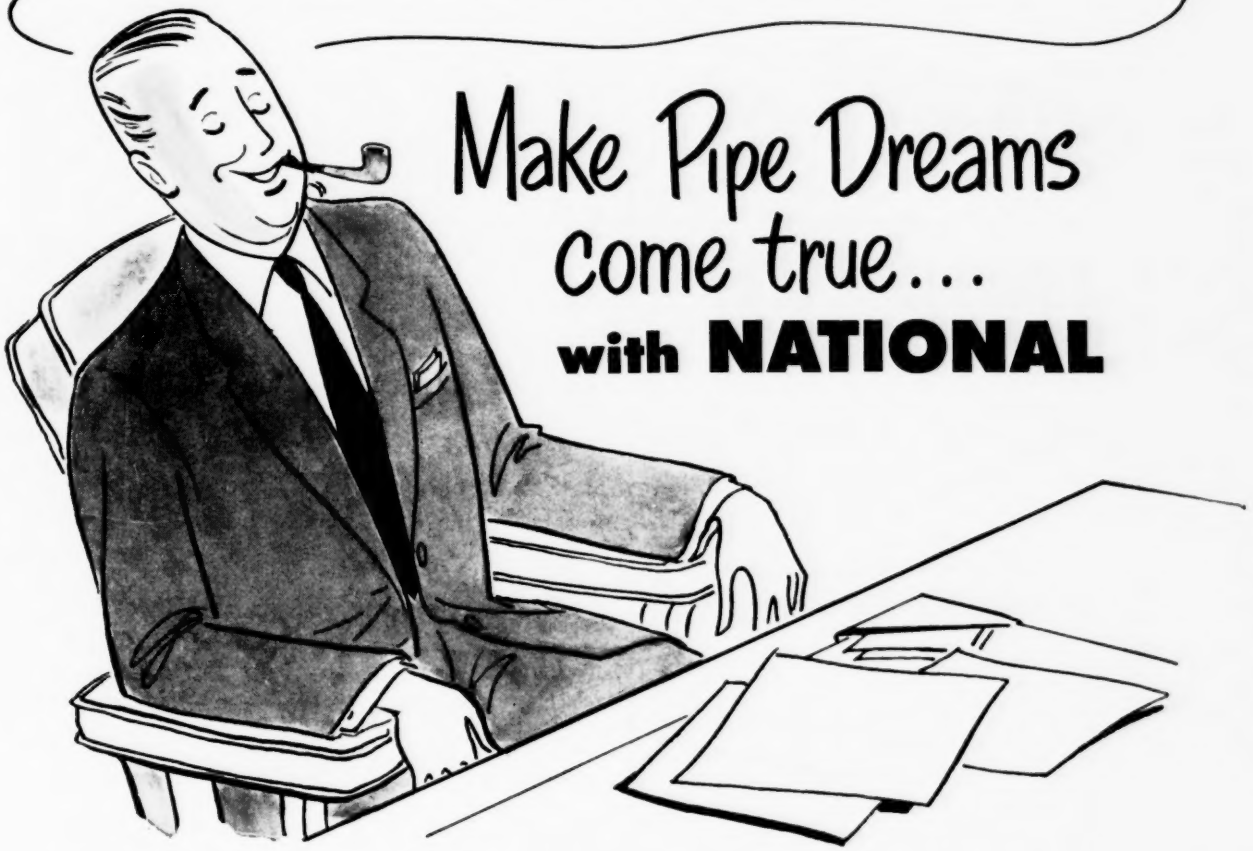
Joseph Askin (*Refrigeration Systems for Cooling Drinking Water*, page 81) is a 1922 graduate of the College of Engineering and Architecture, University of Michigan. Well versed in various phases of refrigeration, he was granted 33 patents covering liquid cooling apparatus, refrigerant controls and apparatus, automatic ice cube maker, aircraft oil cooler, and many others.

He was chief engineer, Fedders Mfg. Co., Buffalo, N. Y., from 1923 to 1944, carrying on experimental work on electric water coolers, electric refrigeration, beverage and beer coolers, expansion valves, oil coolers and radiators. From 1944 to 1947, he was chief engineer, Peerless of America, doing design and experimental testing of commercial refrigeration and radiation equipment. The following year he served as chief engineer, Electrimatic Division of Simoniz Corp., on the design of refrigeration and air conditioning components.

After a two-year period as consulting engineer on radiation and air conditioning equipment, he was employed as

(*Continued on page* 152)

SPECIFY *ONE* WORRY-FREE PIPE . . . THAT HAS *ALL* DESIRED QUALITIES . . . MEETS ALL SERVICE REQUIREMENTS . . . LOW FIRST COST, MINIMUM MAINTENANCE.



Make Pipe Dreams come true . . . with NATIONAL

If you have been wishing you could find *one* brand of pipe that would meet *all* service requirements, it's high time you got better acquainted with National Steel Pipe. So many architects, engineers and contractors have found the National line the solution to so many piping problems—during more than half a century—that they have made National the largest selling pipe in the world.

That preference was earned by the uniform high quality and complete dependability that is built into U·S·S National Steel Pipe. From raw material to finished pipe, every step in its production is controlled by one responsible organization. Improved steel-making facilities, special manufacturing processes and the lifetime experience of many skilled craftsmen, combine to produce pipe whose metallic structure, strength, sound joints, superior welding, bending and threading properties, assure low cost installation and long trouble-free performance.

That is why shrewd pipe buyers—generation after generation—continue to specify National, whenever they need pipe. They know that it fits every purpose at a cost that fits every purse.

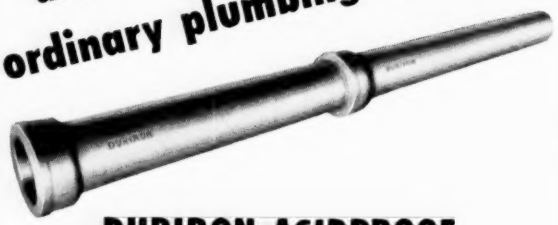
So, whenever you need pipe for any type of building, make your pipe dreams come true. Get U·S·S National Steel Pipe.

NATIONAL TUBE DIVISION, UNITED STATES STEEL CORPORATION, PITTSBURGH, PA.
COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO, PACIFIC COAST DISTRIBUTORS
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

U·S·S NATIONAL Steel PIPE

UNITED STATES STEEL

The permanent drain pipe installed by ordinary plumbing methods

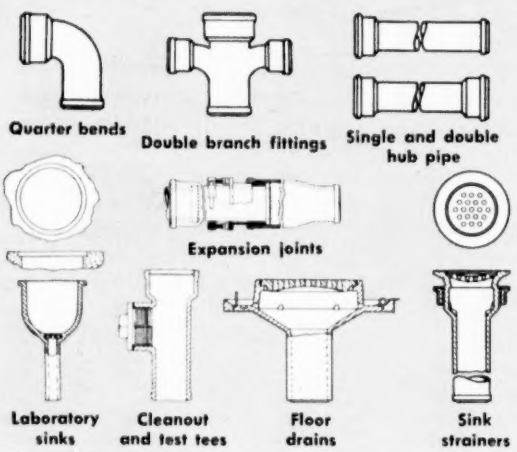


DURIRON ACIDPROOF DRAIN PIPE AND FITTINGS

Duriron is a high silicon iron alloy highly resistant to most commercial acids at practically all temperatures and concentrations. It is not a coating—the entire thickness of the pipe wall is resistant to abrasion and erosion as well as to corrosion.

The labor cost of installing Duriron is the same as with ordinary cast iron soil pipe. Normally the initial cost is the final cost since Duriron will generally outlast the building in which it is installed.

SOME OF THE MORE THAN 60 STANDARD DURIRON FITTINGS



AVAILABLE FROM STOCK IN PRINCIPAL CITIES

Write for Bulletin PF/1

THE DURIRON COMPANY, Inc.

402 North Findlay Street

DAYTON, OHIO

DURIRON

LOOK FOR THE NAME ON EVERY PIECE

(*Continued from page* 150)

chief engineer, Techniflex Corp., and by Kramer-Trenton Co. At present he is with Tele-King Corp.

Aside from this technical work, for a period of 13 years he taught evening classes in electrical refrigeration and air conditioning at a technical high school, and from 1934 to 1941 served as technical editor of *Fedders News*. In addition to technical articles, he is the author of an air conditioning course for an industrial school.

W. C. Knight

Walter C. Knight (*Plumbing Fixtures for Industrial Plants*, page 99) executive engineer, Guy B. Panero Engineers, New York City, has been actively engaged as designer and supervisor in many phases of mechanical and civil engineering for more than 35 years. He has been with Guy B. Panero Engineers for the last 25 years.

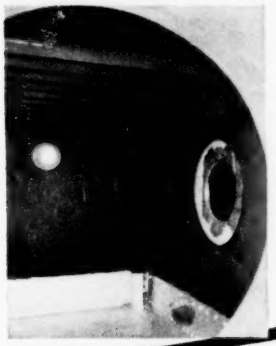
Among the many prominent projects with which Mr. Knight has been associated are: Waldorf-Astoria Hotel, City Bank Farmers Trust Building, Rockefeller Center, Sloan-Kettering Research Institute, James Ewing Hospital—all in New York City; Veterans Administration Neuropsychiatric Hospital, Pittsburgh, Pa.; National Gallery of Art, Washington, D. C., and a number of private and government projects.

Canadian Degree-Days for December, 1952*

City	December		Cumulative	
	1952	Normal	1952	Normal
Calgary, Alta.	1223	1426	3238	3702
Charlottetown, P.E.I.	1200	1246	1834	2865
Crescent Valley, B. C.	1082	1240	2922	3279
Edmonton, Alta.	1396	1578	3467	3984
Fort William, Ont.	1327	1596	3633	3815
Grande Prairie, Alta.	1643	1649	3749	4159
Halifax, N. S.	1035	1138	2388	2615
London, Ont.	1073	1200	2673	2677
Medicine Hat, Alta.	1299	1417	3031	3389
Moncton, N. B.	1218	1373	3088	3186
Montreal, P. Q.	1215	1407	2806	3096
North Bay, Ont.	1364	1528	3422	3503
Ottawa, Ont.	1246	1494	4015	3277
Penticton, B. C.	893	1073	2369	2626
Porquis Junction, Ont.	1482	1786	3865	4248
Prince George, B. C.	1277	1504	3380	3757
Quebec City, P. Q.	1308	1534	3136	3511
Regina, Sask.	1563	1779	3867	4336
St. John, N. B.	1132	1271	2709	2969
Saskatoon, Sask.	1628	1767	3820	4249
Toronto, Ont.	966	1155	2352	2644
Vancouver, B. C.	725	818	2034	2168
Victoria, B. C.	691	738	1928	1910
Windsor, Ont.	989	1172	2339	2446
Winnipeg, Man.	1497	1829	3673	4205

*These data are supplied through the courtesy of the Meteorological Division, Air Service Branch, Department of Transport, Canada.

The Department reports a slight revision in the figure for Crescent Valley, B. C. for November, as published in last month's issue. Corrected figure is 1041.



Looking into well-kept water basin through fan port. Glass port at right and interior lighting permit engineering students to observe break-up and distribution of cooling water.

45 YEARS OLD . . .
THIS C. H. WHEELER COOLING TOWER *Still Works Like New*

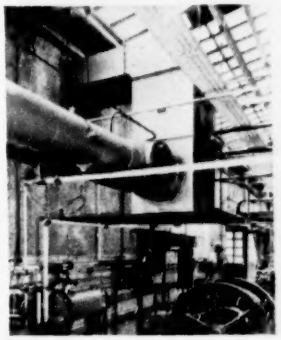
First C. H. Wheeler forced draft tower built in 1906. 4'3"x6'x53'9" high. Metal casing.

At the Towne Scientific School of the historic University of Pennsylvania in Philadelphia a C. H. Wheeler Water Cooling Tower has been in service since 1906. It was the first mechanical draft cooling tower built by the C. H. Wheeler Mfg. Co. and some believe it is the first one built in this country.

In all these years the wood fill has never required replacement. It's still distributing and breaking up cooling water as efficiently as the day it was first put in service. The inside metal casing has never required repairing above the water basin area. Another smaller C. H. Wheeler Cooling Tower has also served this engineering school for several decades. Both are forced draft towers.

These are but two of many C. H. Wheeler towers that have stood for twenty years and more, as testimony to the quality of workmanship and materials that go into every tower we build. Of course, length of service depends on proper care. C. H. Wheeler engineers have prepared a *"Blue print for Operating and Maintaining Mechanical Draft Cooling Towers."* A request on your company letterhead will bring your copy promptly by mail.

FOUNDER MEMBER
CTI
COOLING TOWER INSTITUTE



Another, smaller C. H. Wheeler water cooling tower suspended from beams in another section of the Towne Scientific School.

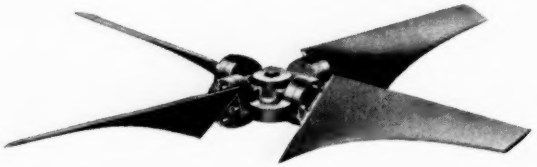
114

C. H. WHEELER *of Philadelphia*

COOLING TOWER DIVISION, 407 S. DEARBORN STREET, CHICAGO 5, ILL.

Steam Condensers • Centrifugal, Axial and Mixed Flow Pumps • Steam Jet Ejectors • Cooling Towers • Vacuum Refrigeration
High Vacuum Process Equipment • Micro-Particle Reduction Mills • Marine Condensers and Ejectors • Deck Machinery

THIS SPECIALLY DESIGNED BURT AIRFOIL FAN



RAPIDLY EXHAUSTS AN UNOBSTRUCTED COLUMN OF AIR VERTICALLY UPWARD TO QUICKLY REMOVE HEAT, SMOKE, FUMES, DUST . . .

THE BURT F.E.F. VENTILATOR IS EXTREMELY EFFICIENT

If your problem is rapid spot removal of contaminated air, investigate Burt's new F.E.F. (Free Exhaust Fan) Ventilator. Two dampers open wide automatically when the Burt Axial Flow Airfoil Fan is operating—close automatically for thorough weather-proofing when motor is shut down. The air shaft functions as an absolute free opening in use. Seven sizes and seventeen motor choices provide capacities from 5,000 C.F.M. to 75,500 C.F.M. For complete data see Sweet's, or write for Bulletin S.P.V.-13.

FAN & GRAVITY VENTILATORS • LOUVERS • SHEET METAL SPECIALTIES

The Burt Manufacturing Company

49 E. South Street, Akron 11, Ohio

WHAT READERS SAY

Fan Static Pressure

EDITOR, HEATING AND VENTILATING

In reference to Mr. Lubinsky's article, Selection of Centrifugal Fans (Dec. 1952), I would like to comment on the statement made that:

"The fan static pressure is equal to the discharge static pressure minus the total pressure at the fan inlet."

Or,

$$h_{s\ fan} = h_{s\ disch} - h_{T\ inlet}$$

From the field engineer's viewpoint this formula is very convenient to use since readings with a pitot tube can be taken at the fan inlet and discharge points and the fan static pressure can easily be obtained. However, from the design engineer's viewpoint, I believe that this formula should be modified to avoid confusion and to facilitate computation.

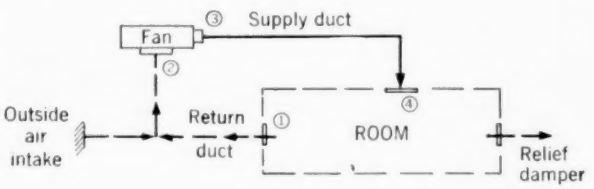


Fig. 1. Typical ventilation system.

Fig. 1 is a schematic diagram of a typical air conditioning system. Point (1) corresponds to the return grille inlet; point (2) the fan inlet; Point (3) the fan discharge; and point (4) the discharge register or diffuser. Then,

$$h_{s\ fan} = h_{s3} - h_{T2}$$

But, $h_{s3} + h_{v3} = h_{s4} + h_{v4} + h_{loss\ (3\text{-}4)}$

And, $h_{T2} = h_{s1} + h_{v1} - h_{loss\ (1\text{-}2)}$

$$\therefore h_{s\ fan} = h_{s4} + h_{v4} + h_{loss\ (3\text{-}4)} - h_{v3} - h_{s1} - h_{v1} + h_{loss\ (1\text{-}2)}$$

But, $h_{s4} = h_{s1}$

$$\therefore h_{s\ fan} = (\Sigma h_{loss(1\text{-}4)} + h_{v4}) - (h_{v3} + h_{v1})$$

This equation states that the fan static pressure is equal to the sum of the losses throughout the system, plus the velocity head at the register or diffuser, minus the fan outlet velocity head, minus the velocity head at the return grille.

Many designers knowingly or unknowingly leave out the velocity components in calculating the fan static pressure. This practice can sometimes lead to a costly mistake due to the fact that when the actual operating static pressure is far below the calculated static pressure, the fan horsepower requirement rises sharply.

In passing, I might add that the proposed method of figuring fan static pressare is purely theoretical and assumes 100% conversion of velocity pressure to static pressure. Tests show that in practice the conversion is 70% to 80%. For this reason, I usually add a minimum of 0.10 inch static pressure safety factor.

Where Fig. 1 calls for a relief damper, an exhaust fan may be used to prevent pressure build-up in the conditioned space when using close to 100% outside air during the mild season.

J. T. Inatome

Detroit, Mich.

a good address

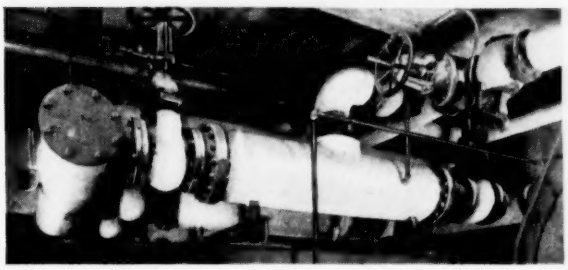
Rittenhouse Claridge
Philadelphia

Twenty-five story, 482-family Rittenhouse-Claridge apartment building, Philadelphia. Owners: M. H. McCloskey and Kevy K. Kaiserman; Builders: McCloskey & Co., Architects: J. Raymond Knopf, Samuel I. Oshiver, J. Ethan Fieldstein; Structural Engineers: Robert E. McLaughlin; Mechanical Engineer: Leslie S. Tarleton. Contractors: Ambrose-Augusterfer Corp.

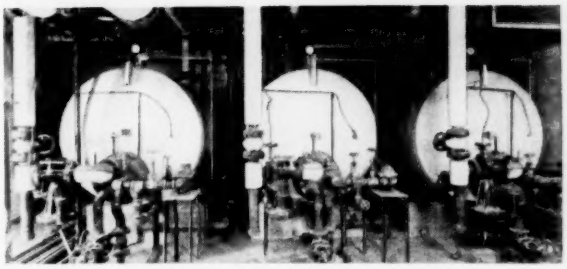
where p-k equipment is at home.....at work

This new, modern apartment house is well equipped to supply its 482 tenant-families with adequate heat and clean, hot water—and the same **p-k** equipment keeps pavement areas free of snow in winter time. Like many other modern apartment owners, **p-k** equipment was chosen by the owners of the Rittenhouse-Claridge for efficient, dependable, economical operation.

Full information and engineering help is yours for the asking. Write today.



Three Type O **p-k** single pass Hot Water Converters are in use at the new, modern Rittenhouse-Claridge. Each heats 785-gpm of water from 160°F to 180°F with steam at 25 psig



Three 60" x 168" Type B **p-k** Storage Heaters are used. Each has a live steam section to heat 3600 gph from 40°F to 180°F with steam at 5 psig and a condensate cooling element with 75 sq. ft. of surface.

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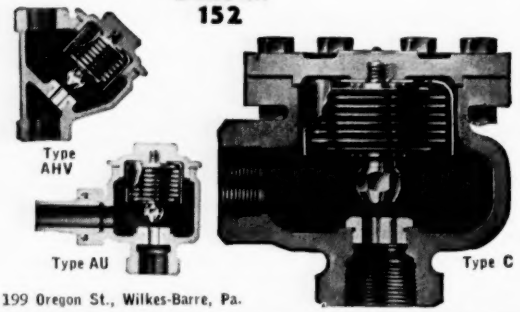
Bulletin 152



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DEGREE - DAYS FOR DECEMBER, 1953

HEATING AND VENTILATING'S 25th Year of Publication of Monthly Degree-Day Data

City	December		
	1952	1951	Normal
Abilene, Texas	596	508	592
Albany, New York	1071	1169	1147
Albuquerque, New Mexico	965	888	924
Alpena, Michigan	1044	1243	1247
Anaconda, Montana	1151	1419	1321
Asheville, North Carolina	793	736	837
Atlanta, Georgia	655	549	639
Atlantic City, New Jersey	762	734	893
Augusta, Georgia	593	470	549
Baker, Oregon	1111	1257	1156
Baltimore, Maryland	747	734	874
Billings, Montana	1001	1413	1194
Binghamton, New York	986	1043	1156
Birmingham, Alabama	613	484	595
Bismarck, North Dakota	1370	1832	1553
Block Island, Rhode Island	837	800	884
Boise, Idaho	951	1156	1011
Boston, Massachusetts	901	923	1026
Bozeman, Montana	1227	1430	1293
Buffalo, New York	975	1062	1104
Burlington, Iowa	1037	1258	(a)
Burlington, Vermont	1174	1234	1287
Butte, Montana	1256	1496	1261
Cairo, Illinois	738	743	822
Charleston, South Carolina	461	314	425
Charlotte, North Carolina	701	632	679
Chattanooga, Tennessee	707	645	694
Cheyenne, Wyoming	1079	1251	1144
Chicago, Illinois	945	(a)	1074
Cincinnati, Ohio	793	846	927
Cleveland, Ohio	929	1065	1060
Columbia, Missouri	927	1047	985
Columbia, South Carolina	574	453	561
Columbus, Ohio	909	992	1017
Concord, New Hampshire	1117	1246	1234
Concordia, Kansas	1118	1139	1020
Dallas, Texas	571	479	567
Davenport, Iowa	1028	1237	1175
Dayton, Ohio	935	1043	1014
Deer Lodge, Montana	1267	1447	1331
Denver, Colorado	1000	1108	1017
Des Moines, Iowa	1162	1372	1215
Detroit, Michigan	953	1126	1113
Devils Lake, North Dakota	1493	1873	1710
Dodge City, Kansas	1060	1013	1004
Dubuque, Iowa	1186	1409	1243
Duluth, Minnesota	1318	1675	1519
Eastport, Maine	1082	1155	1228
Elkins, West Virginia	943	944	1035
El Paso, Texas	642	569	617
Ely, Nevada	1247	1439	(a)
Erie, Pennsylvania	896	955	1039
Escanaba, Michigan	1102	1369	1344
Evansville, Indiana	811	854	862
Fargo, North Dakota	1430	1798	1609
Fort Smith, Arkansas	745	712	707
Fort Wayne, Indiana	987	1159	1138
Fort Worth, Texas	563	476	574
Fresno, California	554	620	577
Galveston, Texas	288	196	270
Grand Junction, Colorado	1142	1293	1162
Grand Rapids, Michigan	1037	1197	1147
Green Bay, Wisconsin	1215	1436	1324
Greensboro, North Carolina	771	749	760
Greenville, South Carolina	668	613	738
Harrisburg, Pennsylvania	888	954	992
Hartford, Connecticut	955	1005	1060
Hatteras, North Carolina	532	394	493
Havre, Montana	1288	1699	1383
Helena, Montana	1305	1563	1245
Houston, Texas	327	239	335
Huron, South Dakota	1281	1671	1431
Indianapolis, Indiana	929	1060	1017
Jackson, Mississippi	503	393	(a)
Kansas City, Missouri	961	1056	1008
Knoxville, Tennessee	746	669	781
La Crosse, Wisconsin	1236	1423	1311
Lander, Wyoming	1287	1389	1419

(a) Data not available.

City	December		
	1952	1951	Normal
Lansing, Michigan	1028	1215	1209
Lewiston, Maine	1027	(a)	1295
Lincoln, Nebraska	1166	1307	1132
Little Rock, Arkansas	645	625	651
Livingston, Montana	1019	988	1117
Los Angeles, California	281	324	301
Louisville, Kentucky	791	824	849
Lynchburg, Virginia	803	789	800
Macon, Georgia	564	413	567
Madison, Wisconsin	1135	1346	1321
Marquette, Michigan	1116	1349	1302
Memphis, Tennessee	647	594	633
Meridian, Mississippi	540	406	549
Milwaukee, Wisconsin	1061	1270	1221
Minneapolis, Minnesota	1284	1500	1404
Moline, Illinois	1062	1283	(a)
Montgomery, Alabama	539	392	496
Nantucket, Massachusetts	858	840	905
Nashville, Tennessee	697	655	744
New Haven, Connecticut	912	915	1017
New Orleans, Louisiana	278	199	301
New York, New York	821	798	940
Newark, New Jersey	860	855	980
Norfolk, Virginia	621	520	685
North Head, Washington	622	726	654
North Platte, Nebraska	1220	1348	1173
Oakland, California	460	511	496
Oklahoma City, Oklahoma	795	720	815
Omaha, Nebraska	1180	1385	1175
Oswego, New York	989	1046	1138
Parkersburg, West Virginia	826	834	921
Peoria, Illinois	1005	1198	1150
Philadelphia, Pennsylvania	785	1590	884
Phoenix, Arizona	377	378	425
Pittsburgh, Pennsylvania	853	881	967
Pocatello, Idaho	1176	1301	1181
Portland, Maine	1073	1219	1159
Portland, Oregon	654	790	729
Providence, Rhode Island	887	883	1026
Pueblo, Colorado	1023	1034	1029
Raleigh, North Carolina	674	562	694
Rapid City, South Dakota	1090	1471	1172
Reading, Pennsylvania	847	873	1001
Red Bluff, California	613	615	(a)
Reno, Nevada	952	1062	973
Richmond, Virginia	751	676	763
Rochester, New York	974	1078	1125
Roswell, New Mexico	770	711	808
Sacramento, California	537	587	574
St. Joseph, Missouri	1055	1177	1079
St. Louis, Missouri	832	924	936
Salt Lake City, Utah	1014	1199	1020
San Antonio, Texas	411	319	347
San Diego, California	259	285	288
Sandusky, Ohio	905	1041	1063
San Francisco, California	408	460	428
Sault Ste. Marie, Michigan	1157	1448	1370
Savannah, Georgia	500	303	397
Scranton, Pennsylvania	949	1003	1085
Seattle, Washington	609	773	719
Sheridan, Wyoming	1103	1450	1320
Shreveport, Louisiana	519	432	499
Sioux City, Iowa	1285	1462	1265
Spokane, Washington	1069	1319	1057
Springfield, Illinois	912	1064	1039
Springfield, Missouri	889	930	893
Syracuse, New York	1022	1068	1172
Tacoma, Washington	654	819	756
Terre Haute, Indiana	911	1036	992
Toledo, Ohio	987	1150	1079
Topeka, Kansas	1010	1085	1008
Trenton, New Jersey	840	828	930
Utica, New York	1087	1124	1144
Valentine, Nebraska	1243	1512	1245
Walla Walla, Washington	826	1044	896
Washington, D. C.	783	746	896
Wichita, Kansas	984	964	955
Williston, North Dakota	1329	1833	1591
Winnemucca, Nevada	976	1193	1080
Yakima, Washington	1002	1194	1091

(a) Data not available.

Figures in this table, with seven exceptions, based on local weather bureau reports. Exceptions are Utica and Lewiston, figures for which are furnished through the courtesy of Coke Sales Department, Central New York Power Corp., Utica, N. Y., and Norman E. Ross, Bursar, Bates College, Lewiston, Me., respectively; Anaconda, Bozeman, Butte, Deer Lodge and Livingston, Mont., through the courtesy of the Montana Power Company.

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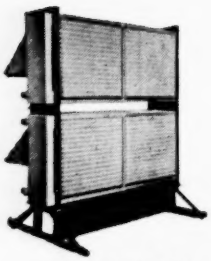

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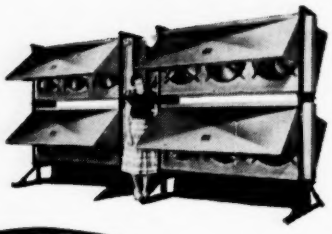

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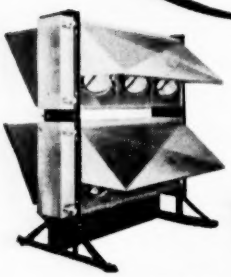

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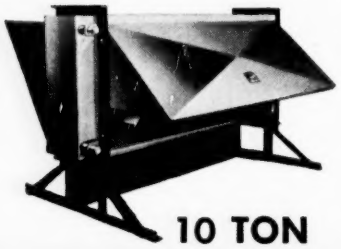

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WRITE FOR BULLETIN U-177-S

ATENT PENDING

KRAMER TRENTON CO.
Trenton 5, N.J.

• Stanley Aaronson has been appointed sales manager of Berko Electric Mfg. Corp., Queens Village, N. Y. He will be responsible for sales of radiant glass heating panels. Mr. Aaronson was formerly in charge of heating sales with Tailored Kitchens, Inc.

• Glen E. Seidel has been elected a vice president of Minneapolis-Honeywell Regulator Company in charge of engineering in the company's Minneapolis plants. Mr. Seidel, a member of the firm's engineering organization since 1943, has been director of its ordnance division for the past year and a half.

COMING EVENTS

Where listed, names or titles of individuals are those from whom further information is available.

INSTRUMENT SOCIETY MEETING—Sixth annual Regional Meeting of the Instrument Society of America, at the Hotel Statler, New York, N. Y. Richard Rimbach, 551 5th Ave., New York 17, N. Y. . . . . **FEBRUARY 18, 1953.**

TESTING MATERIALS MEETING—Spring meeting of the American Society for Testing Materials, at the Hotel Statler, Detroit, Mich. Secretary of the Society, 1916 Race St., Philadelphia 3, Pa. . . . . **MARCH 2-6, 1953.**

CORROSION ENGINEERS EXHIBIT—1953 conference and exhibition of the National Association of Corrosion Engineers, at the Hotel Sherman, Chicago, Ill. Executive secretary of the Association, 1061 M & M Bldg., Houston 2, Texas. . . . . **MARCH 16-20, 1953.**

MICHIGAN ENGINEERING MEETING—Annual meeting of the Michigan Engineering Society, at the Kellogg Center Hotel on Michigan State College Campus, East Lansing, Mich. Joseph E. Wilbur, executive secretary of the Society, Rackham Memorial Bldg., Detroit 2, Mich. . . . . **APRIL 10-11, 1953.**

MASTER PLUMBERS CONVENTION—71st annual convention and exposition of the National Association of Master Plumbers, at Municipal Auditorium, Kansas City, Mo. Oliver F. Erickson, Secretary-Treasurer, National Association of Master Plumbers of the U. S., Inc., 1016-20th Street, N. W., Washington, D. C. . . . . **MAY 6-9, 1953.**

MATERIALS HANDLING EXPOSITION—5th National Materials Handling Exposition, sponsored by The Material Handling Institute, at Convention Hall, Philadelphia, Pa. A series of conferences to be held by the American Materials Handling Society concurrently with the exposition. Clapp & Poliak, Inc., 341 Madison Ave., New York 17, N. Y. . . **MAY 18-22, 1953.**

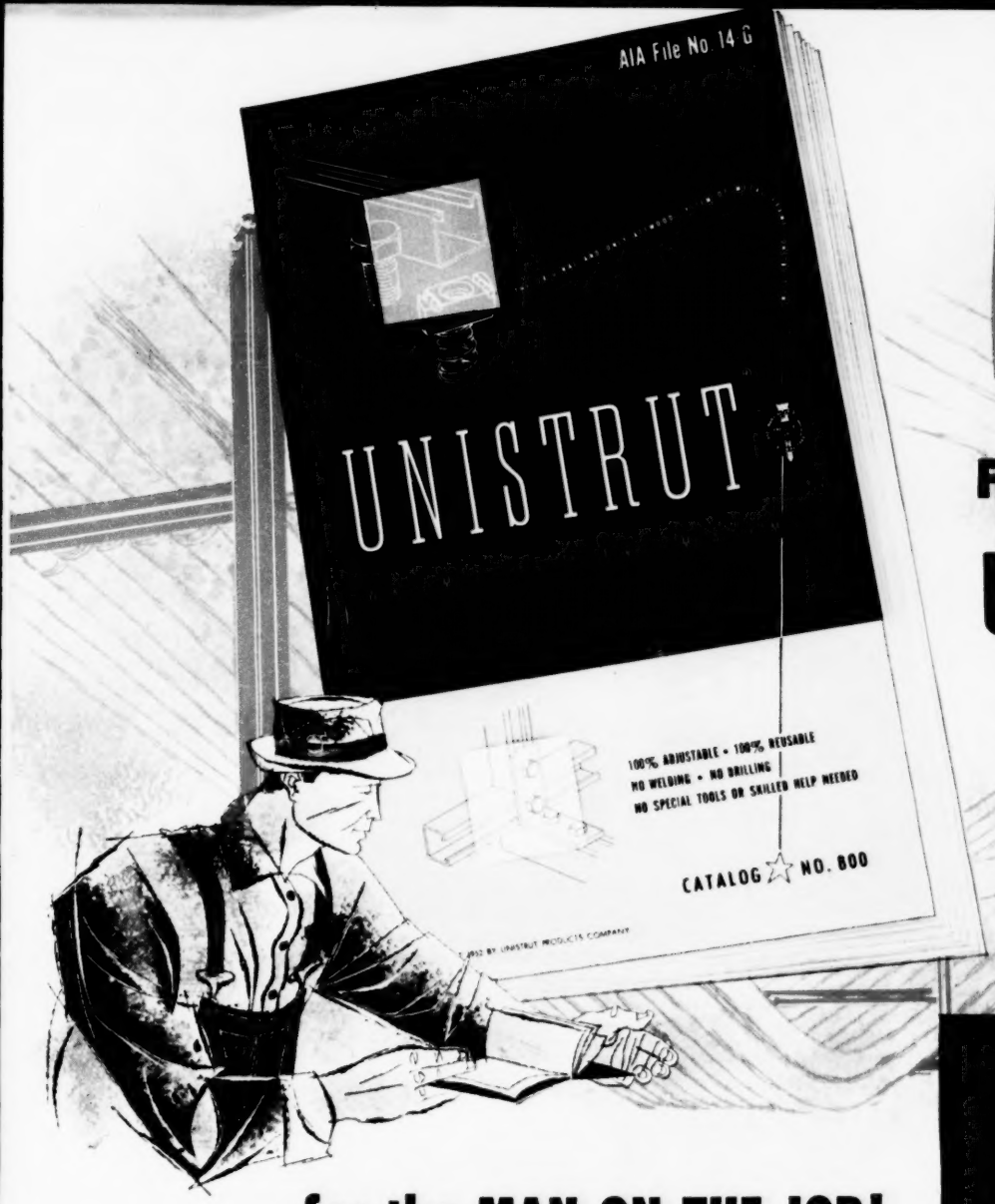
GAMA MEETING—Annual meeting of the Gas Appliance Manufacturers Association, at The Greenbrier Hotel, White Sulphur Springs, West Va. H. Leigh Whitelaw, managing director, 60 E. 42nd St., New York N. Y. . . . . **MAY 20-22, 1953.**

NDHA MEETING—44th annual meeting of the National District Heating Association, at Lookout Mountain Hotel, Chattanooga, Tenn. John F. Collins, secretary of the Association, 827 N. Euclid Ave., Pittsburgh 6, Pa. . . . . **JUNE 9-12, 1953.**

TESTING MATERIALS MEETING—Annual meeting of the American Society for Testing Materials, at the Chalfonte-Haddon Hall, Atlantic City, N. J. Secretary of the Society, 1916 Race St., Philadelphia 3, Pa. . . . . **JUNE 21-25, 1953.**

INSTRUMENT EXHIBIT—8th National Instrument Conference and Exhibit of the Instrument Society of America, at the Sherman Hotel, Chicago, Ill. John McCaffery, assistant executive secretary of the Society, 1319 Allegheny Ave., Pittsburgh 33, Pa. . . . . **SEPTEMBER 21-25, 1953.**

AGA CONFERENCE—Annual conference of the Amecrian Gas Association, at Kiel Auditorium, St. Louis, Mo. Secretary of the Association, 420 Lexington Ave., New York, N. Y. . . . . **OCTOBER 26-29, 1953.**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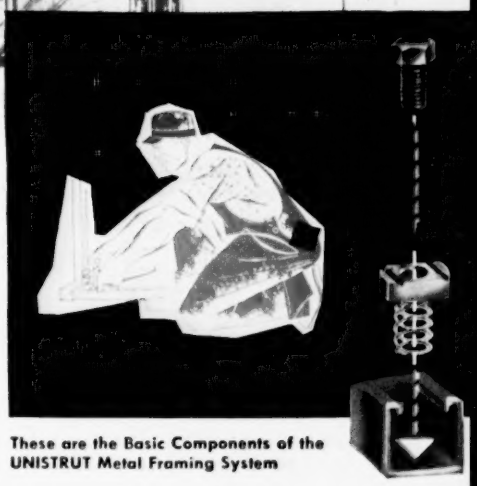

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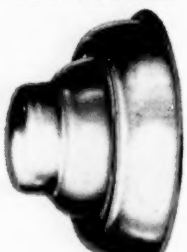

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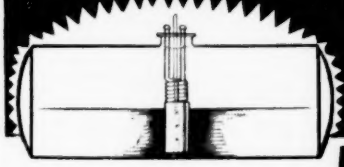

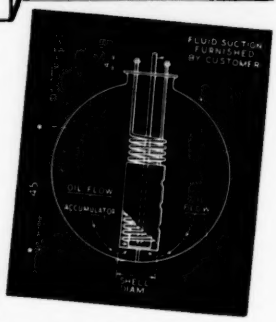

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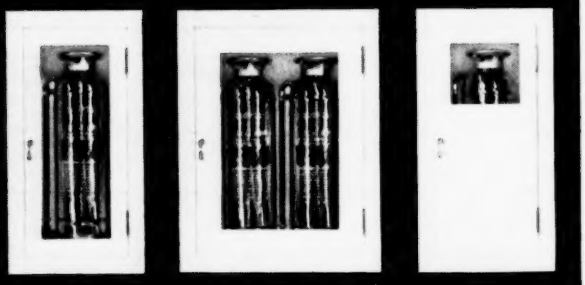

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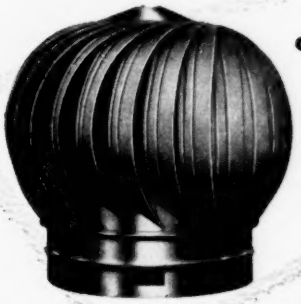

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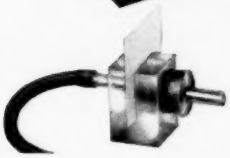

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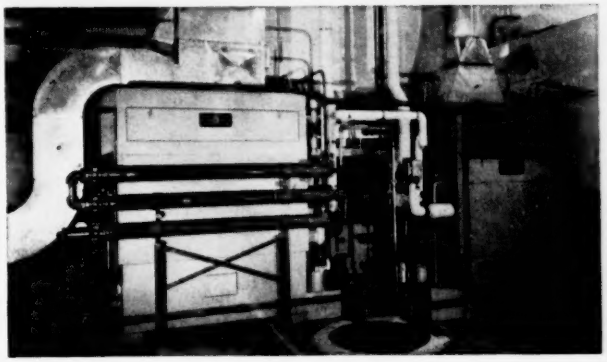

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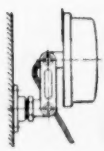

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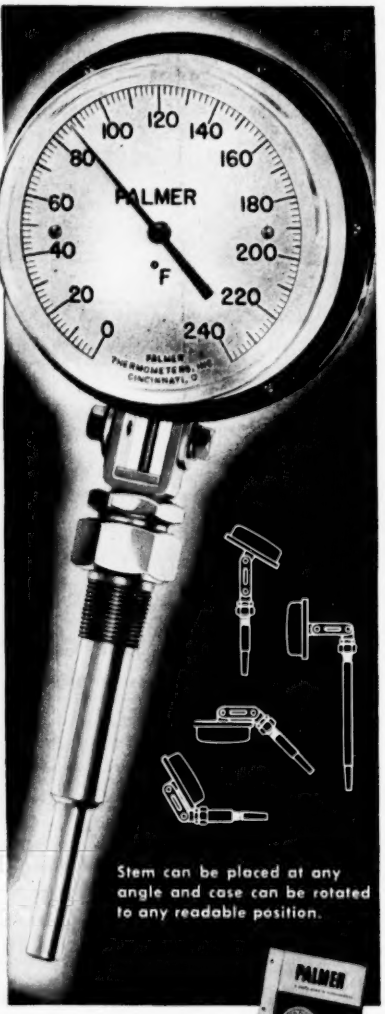

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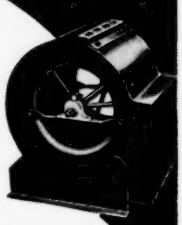

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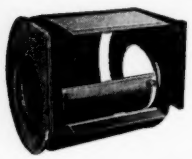

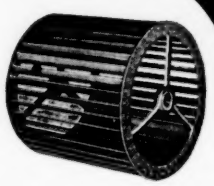

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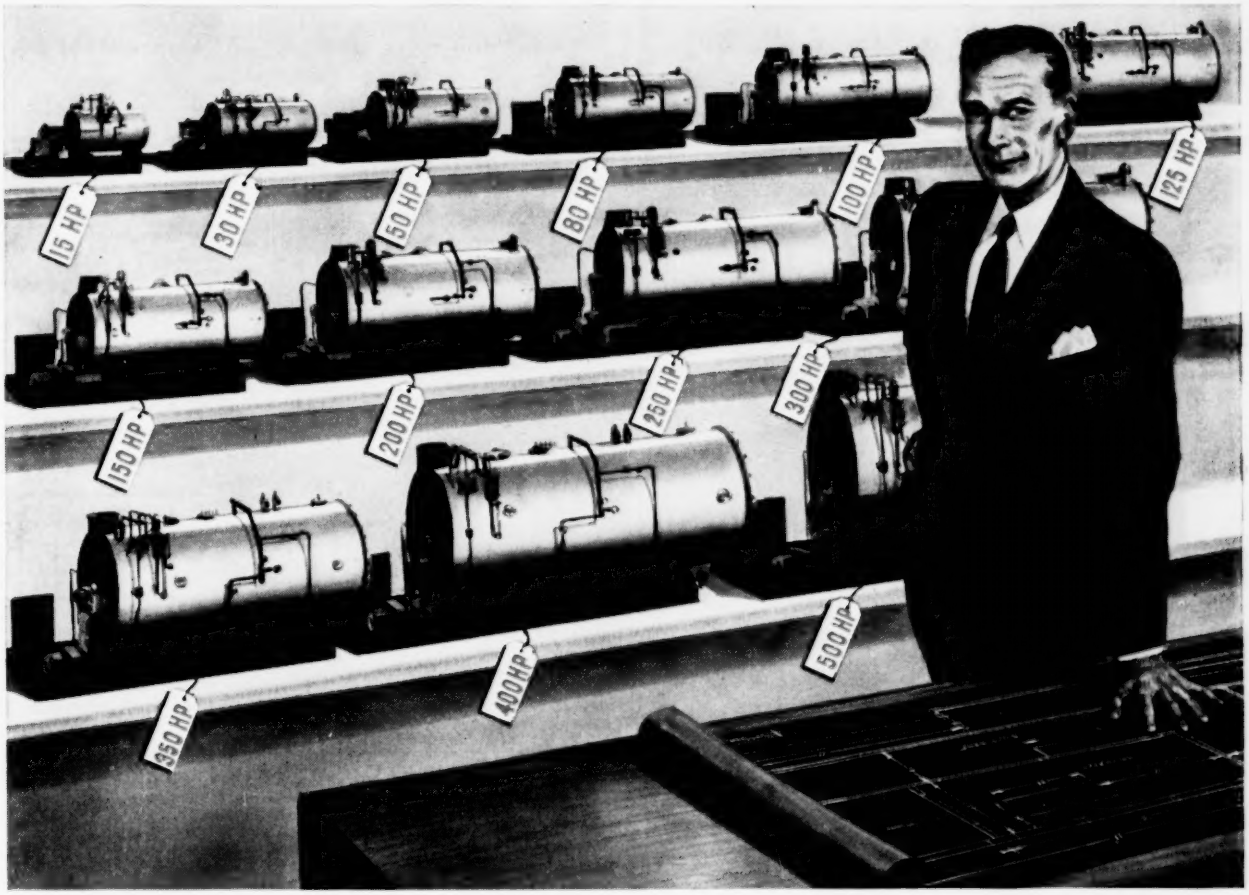

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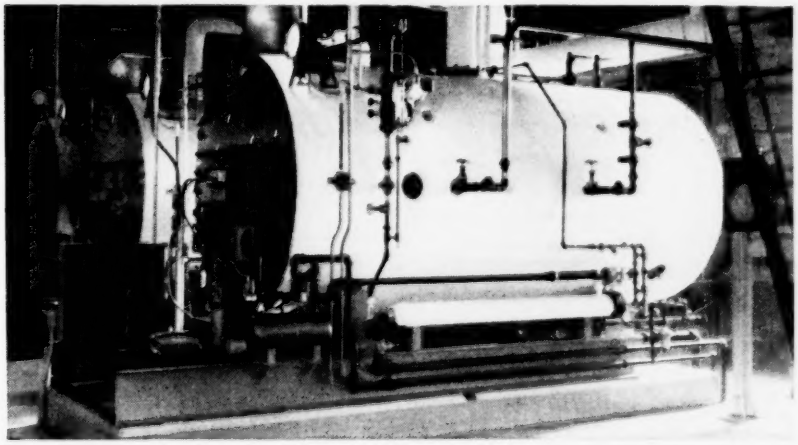

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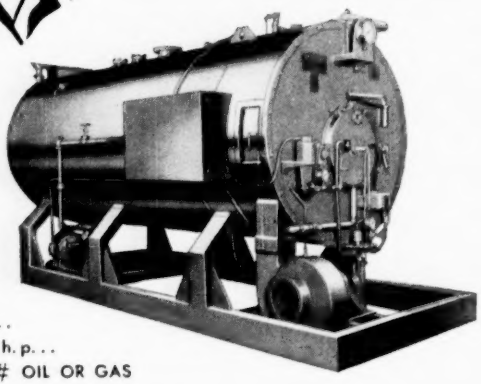

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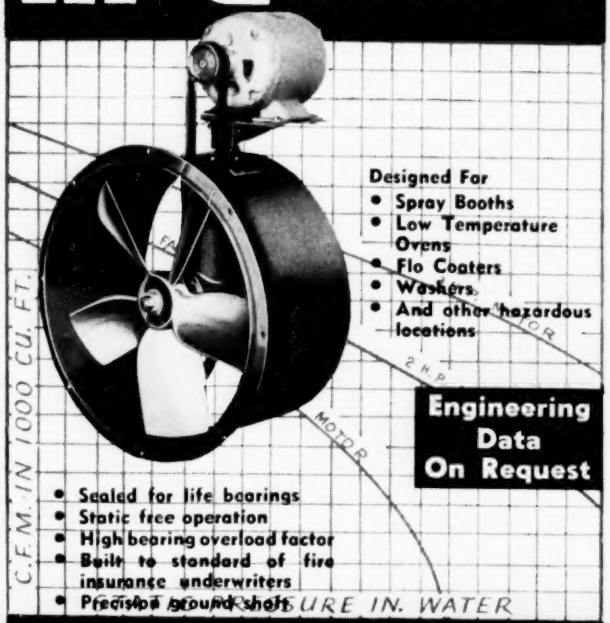

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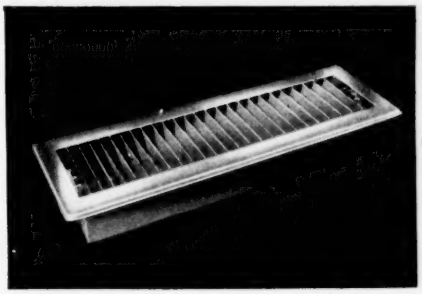

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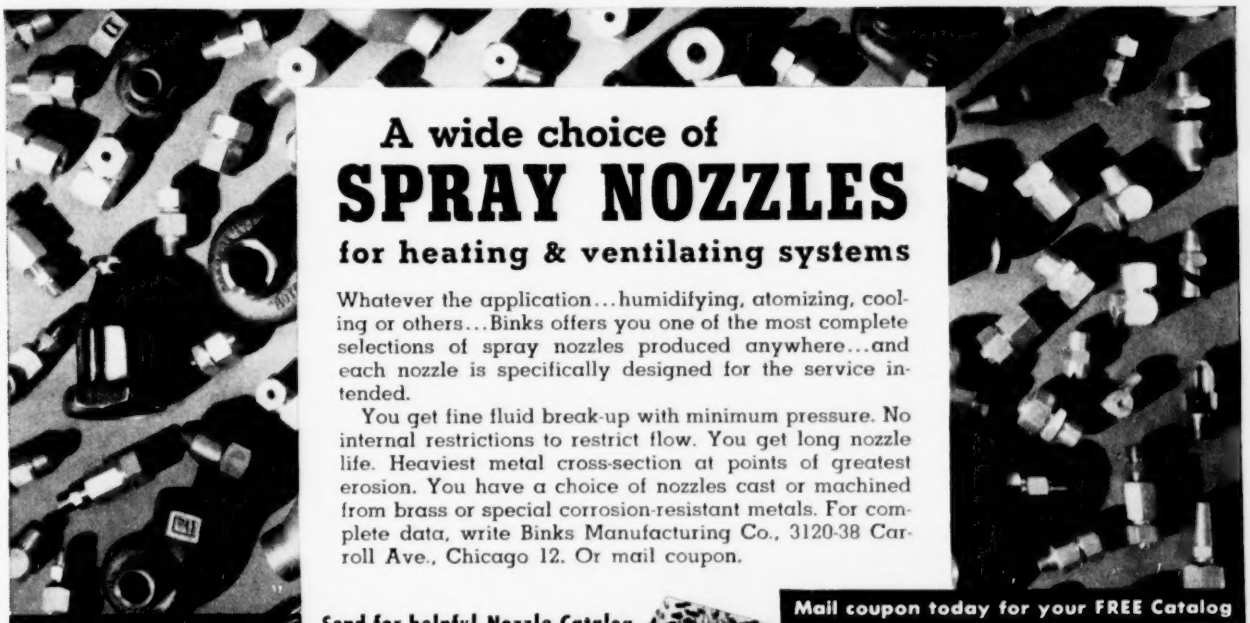

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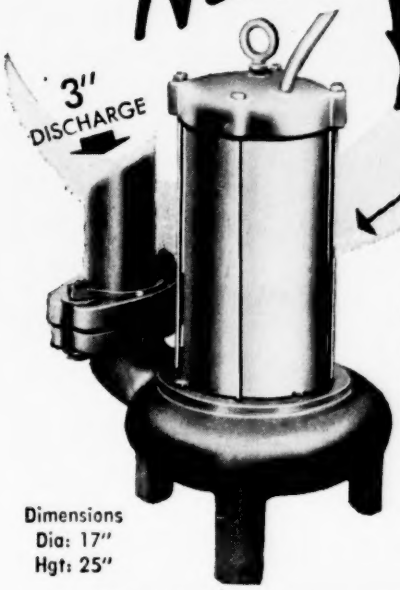

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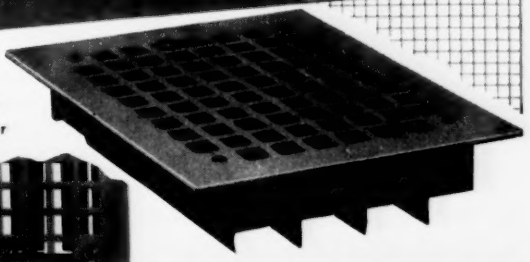

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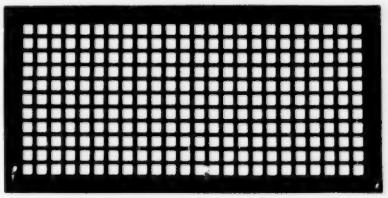

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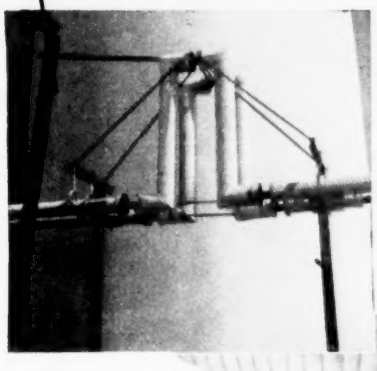
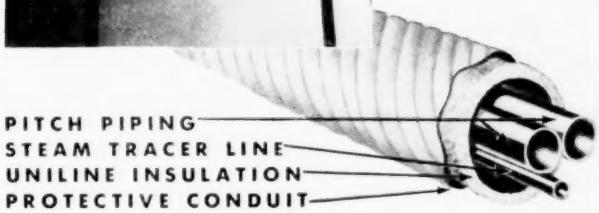


Design requirements for this overhead pitch handling system called for an insulated pipe conduit capable of heating the pitch from its solid state at 25° F. to a minimum pumping temperature of 285° F. and maintaining this temperature.



THE temperatures required are efficiently maintained in Ric-wiL's Uniline System. Pitch piping is nested with a steam tracer line inside an insulation liner which insulates the pipes from the exterior but not from each other. The emission of heat from the steam tracer keeps the pitch in a free-flowing liquid state and at the desired temperature. The entire system is housed within a protective conduit of 16-gauge Armco ingot iron, helically-corrugated and hot-dipped galvanized.

Ric-wiL Uniline Systems are also used to maintain proper flow in piping oil, asphalt, molasses, and many other viscous materials — underground or overhead. Pipe lines subject to corrosive conditions may be coated with Ricwilite, a baked-on phenolic resin having outstanding corrosion resistance and durability.

Scientific design of Ric-wiL Insulated Piping, completely prefabricated with all accessories required, assures high thermal efficiency and speedy, low-cost installation.

● *Write for our latest catalog, or contact us for full technical information on Ric-wiL as applied to your piping problem.*

THE RIC-WIL COMPANY
Mfgrs. Insulated Piping and Conduit Systems
UNION COMMERCE BLDG. • CLEVELAND, OHIO

LEADERS IN INSULATED PIPING PROTECTION

"Reliability for a cold climate" . . . MEN'S DORMITORY AT COLBY COLLEGE, WATERVILLE, MAINE. *Architects,* Jens Frederick Larsen, New York City; *General Contractor,* Hegeman & Harris, New York City; *Engineer,* Thomas Tash, New York City; *Heating Contractor,* M. J. Flaherty, Boston.

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With a B & J Proportionator system of heat control, there is a continuous flow of steam at all times exactly metered to meet the heat losses of the building. The flow of steam to each radiator is increased or decreased as the weather changes. The radiators are filled with steam only when there is a need for full heat. The steam is not completely cut off until the need for heating ceases. The changes in filling are smooth and gradual.

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INCORPORATED
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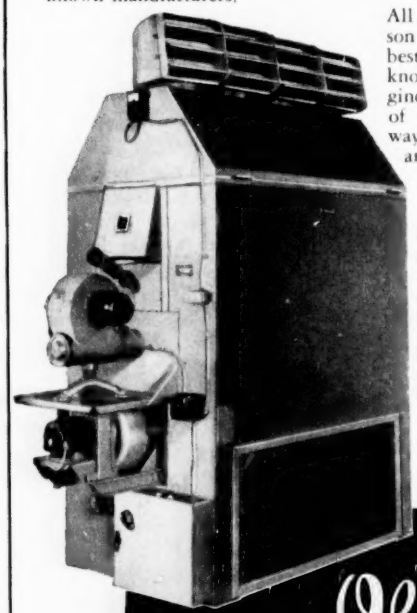
Anyone looking for parts, to repair or service a heater is well off if the parts are standard products of nationally known manufacturers.



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Olson unit or central warm air heaters are manufactured by heating engineers with the "know how" gained from many years of experience in the heating industry.

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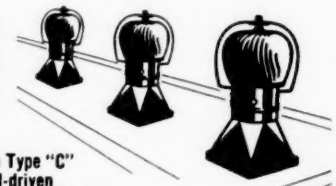

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ALLEN ENGINEERED VENTILATION

PRODUCTION PLANNING CO.
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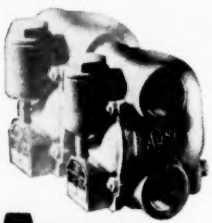
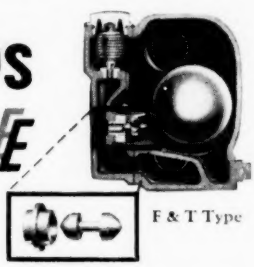
Roof Ventilators for Every Commercial and Industrial Need



ADSCO

WHEN the valve and valve seat of an ADSCO Dual Steam Trap become worn, neither these parts nor the trap itself need to be replaced. Merely reverse the valve and seat by a simple operation and you double the life of the trap . . .

DUAL TRAPS LEAD A DOUBLE LIFE



F & T Type

. . . And here's another great feature of ADSCO Traps. All working parts are mounted on the cover. Pipe connections do not have to be broken for inspection or service . . . ADSCO Dual Steam Traps are extremely compact with large capacity. Dual inlet and outlet connections reduce installation costs. In the type shown here, an internal thermostatic element provides an automatic air bypass . . . For complete information, call an ADSCO representative or write the factory.

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NORTH TONAWANDA, NEW YORK
Since 1877

men over 45

More than six times as many men of your age will die of lung cancer this year as died in 1933, according to official reports. Though our research scientists are making every effort to discover the reason for this increase, they still don't know the answer.

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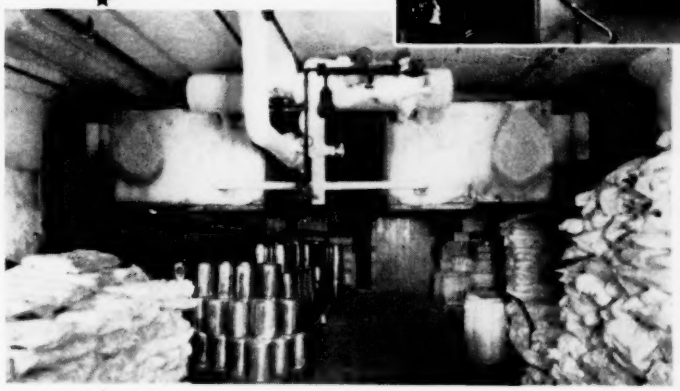
For more information about this or any form of cancer, call our nearest office or simply address your letter to "Cancer" in care of your local Post Office.

American Cancer Society

at

Merchants Ice and Cold Storage Company of Louisville...

It's VILTER Again



So great has been the demand for sharp freeze and 0° storage facilities, Merchants Ice and Cold Storage Company has now converted 9 of its 14 floors from cooler storage to low temperatures. Naturally, Vilter refrigeration has played an important part in the conversion.

A third Vilter Blast Freezer has recently joined the first two, installed in 1948. Vertical Vilter booster compressors handle the enormous load, and Vilter ceiling-suspended air units help save space and save money in the 0° storage rooms.

Vilter users know that they get more than just efficient, economical refrigeration when they buy Vilter. They get equipment that often speeds processes, that may reduce handling, that can save valuable space. And they get equipment that costs less to run—less to keep up. That's why more and more plants are specifying Vilter.

WRITE FOR BULLETINS 110, 205, 206, 223

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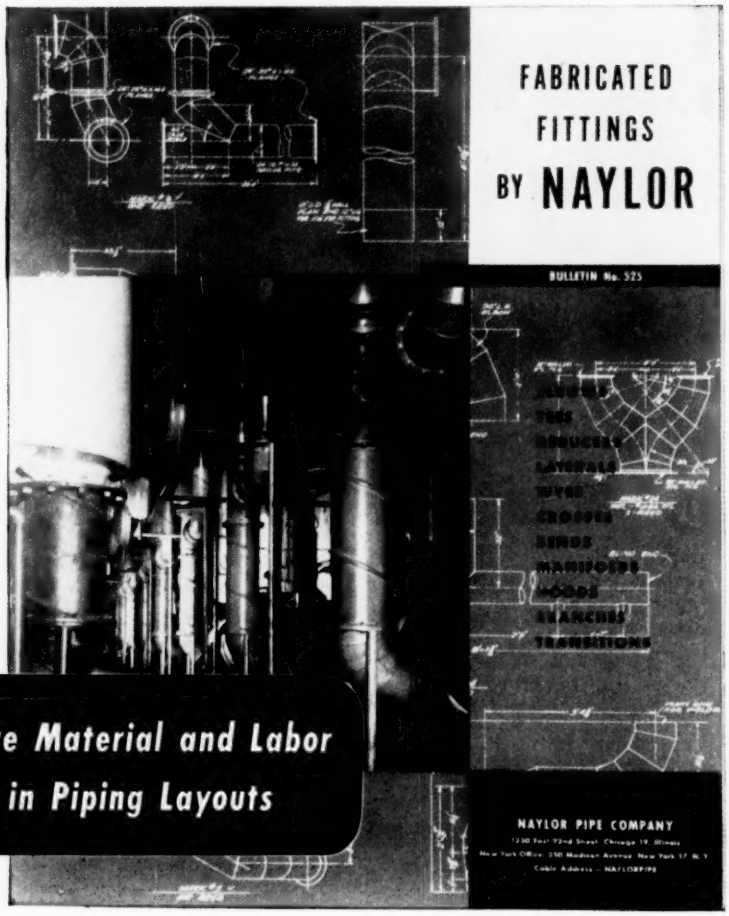

Save Material and Labor in Piping Layouts

Write for this helpful bulletin on Naylor Fabrication Service. It presents data on standard and special fittings for lightweight pipe and offers practical ideas to simplify piping layouts. Included are special fabrications to save time, material and labor through eliminating numerous flanged joints and combining many fittings into one integral unit. Ask for Bulletin No. 525.

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SALES ENGINEER with practical experience in application and usage of air handling equipment. Must be able to analyze fan applications and make recommendations to salesmen and customers. Office and factory in Midwest. Box No. 767, HEATING AND VENTILATING, 148 Lafayette St., New York 13, N. Y.

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An Authoritative Reference Book

For Heating Engineers — Estimators — Air Conditioning Engineers — Ventilating Engineers — Architects — Piping Engineers — Contractors — Plant Engineers — Operating and Maintenance Engineers

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by T. Napier Adlam
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Is there any equipment you need, or would like to sell? Or a position you have open, or want to secure? The Advertisements in HEATING AND VENTILATING'S Classified Advertising Section bring results! Rates are 15 cents a word (minimum charge $3.00); or $8.00 for a single column inch. Please send payments with your order.

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Plant: Amesbury, Mass.
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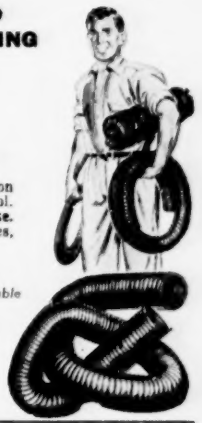

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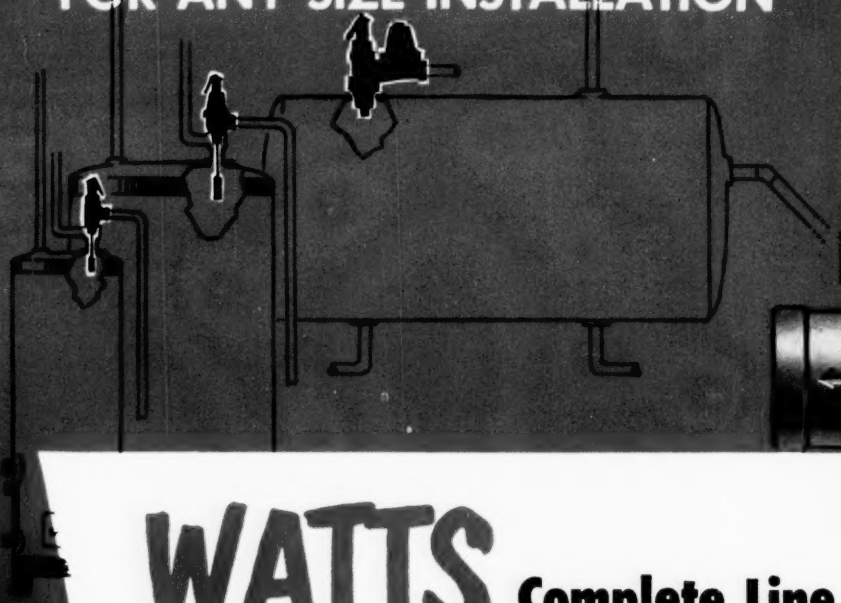
FOR ANY SIZE INSTALLATION



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WATTS Complete Line

Emergency temperature relief protection is necessary for every domestic hot water supply storage system because excessively heated water is dangerous in any quantity. Small water heaters for homes, medium storage tanks for commercial application, large storage tanks for institutional or industrial installation - - every one has specific temperature and pressure relief requirements. Obviously, no one relief valve can meet every need.

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Four models home and commercial installations up to 500,000 BTU/HR. ¾" N.P.T. male inlet.

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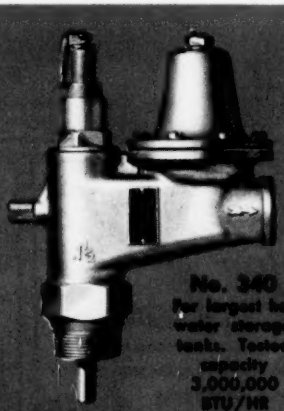
For medium to large institutional and industrial installations up to 1,250,000 BTU/HR 1¼" N.P.T. male inlet.



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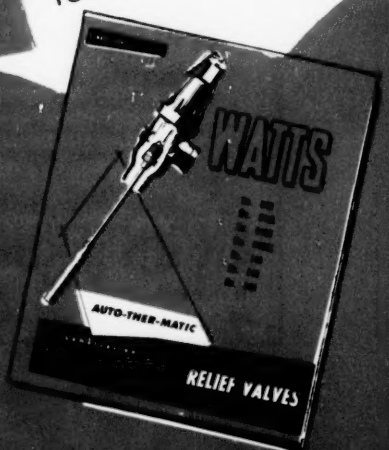
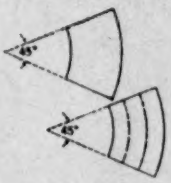
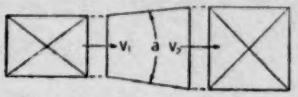
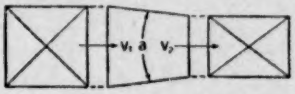
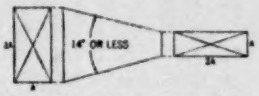
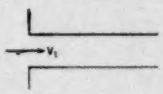
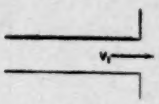
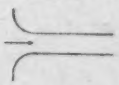
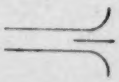
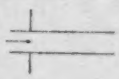
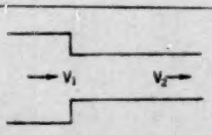


WATTS REGULATOR COMPANY

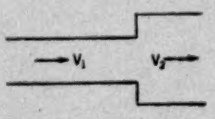
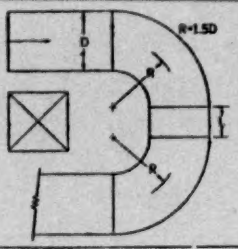
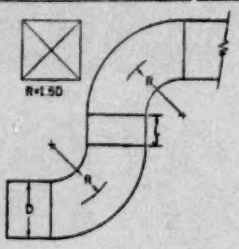
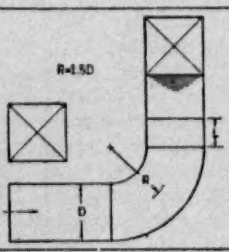
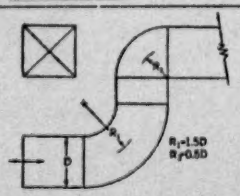
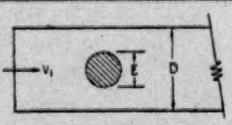
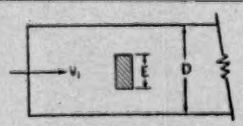
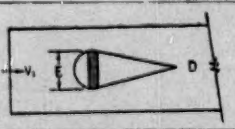
LAWRENCE, MASSACHUSETTS

STATIC PRESSURE LOSSES IN DUCT ELEMENTS

(Concluded from previous Reference Data sheet)

Element	Illustration	Conditions	Value of n	Equivalent Length of Round Duct
9. 45° Elbow		Either rectangular or round. Vaned or unvaned.	½ of value for similar 90° elbow	
10. Expansion		$a = 5°$ $a = 10°$ $a = 20°$ $a = 30°$ $a = 40°$ Loss referred to (hv_1-hv_2)	.17 .28 .45 .59 .73	10D 17D 27D 36D 43D
11. Contraction		$a = 30°$ $a = 45°$ $a = 60°$ Loss referred to V_2	.02 .04 .07	1D 2D 4D
12. Transition Piece			.15	9D
13. Abrupt Entrance			.50	30D
14. Abrupt Exit			1.0	60D
15. Bell Mouth Entrance			.03	2D
16. Bell Mouth Exit			1.0	60D 51D
17. Re-entrant Entrance			.85	170D 140D 115D 90D 60D
18. Sharp Edge Round Orifice		$\frac{A_2}{A_1} = \begin{cases} 0 \\ .25 \\ .50 \\ .75 \\ 1.0 \end{cases}$ Loss referred to V_2	2.8 2.4 1.9 1.5 1.0	30D 27D 19D 11D
19. Abrupt Contraction		$\frac{V_1}{V_2} = \begin{cases} 0 \\ .25 \\ .50 \\ .75 \end{cases}$ Loss referred to V_2	.50 .45 .32 .18	

STATIC PRESSURE LOSSES IN DUCT ELEMENTS

Element	Illustration	Conditions	Value of n	Equivalent Length of Round Duct
20. Abrupt Expansion		$\frac{V_1}{V_2}$ = 0	1.0	60D
		= .20	.64	39D
		= .40	.36	22D
		= .60	.16	9D
		= .80	.04	2D
		Loss referred to V_1		
21. Double Elbows		Loss for both elbows L = 0	.43*	26D
		L = D	.31	19D
		Elbows vaned	.15	9D
		L = 0	.62*	38D
		L = D	.68	40D
		Elbows vaned	.19	12D
		L = 0	.42*	24D
		L = D	.46	28D
		Elbows vaned	.21	12D
		Direction of arrow	1.15*	70D
		Reverse direction	1.03	62D
22. Pipe Running Through Duct		$\frac{E}{D}$ = .10	.20	12D
		= .25	.55	33D
		= .50	2.0	120D
23. Bar Running Through Duct		$\frac{E}{D}$ = .10	.7	40D
		= .25	1.4	80D
		= .50	4.0	24D
24. Streamlined Covering over Obstruction		$\frac{E}{D}$ = .10	.07	4D
		= .25	.23	14D
		= .50	.90	54D

*From R. D. Madison and J. R. Parker, Trans. A.S.M.E., 1936.

PACKAGED V-BELT FAN UNITS

NEW! CLARAGE DEVELOPMENT

Clarage Ready Units are a notable advance in "packaged" fan units — highly efficient, compact, quiet in operation. And, like all other Clarage equipment, you can RELY on them for dependable, economical service.

BETTER FOR MANY AIR HANDLING APPLICATIONS

MOTOR DRIVEN ASSEMBLIES—NO EXPENSIVE FOUNDATIONS REQUIRED

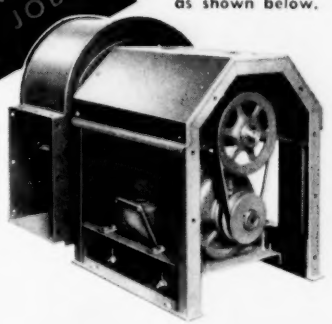
Clarage V-belt Ready Units come in 18 sizes — capacities to 12,000 c.f.m. . . . within their range, the ECONOMY ANSWER to almost any INDOOR or OUTDOOR air handling requirement.

Use Ready Units and save the expense of building separate motor foundations. Use Ready Units and eliminate alignment problems. Use Ready Units for installations in record time and at lowest cost consistent with quality fan equipment.

Ready Units with or without Outdoor Covers shipped immediately. Specially constructed units for handling corrosive gases, etc., take a little longer.

WRITE FOR READY UNIT CATALOG 515 giving details, capacities and dimensions on the most modern "packaged" fan units available today — address, CLARAGE FAN COMPANY, Kalamazoo, Michigan.

INDOOR JOBS

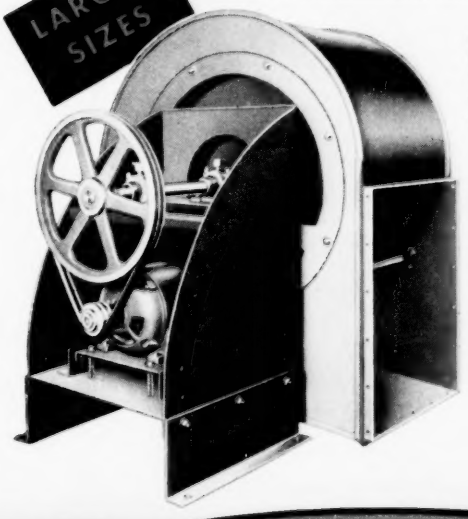


Standard Ready Units (except three largest sizes) afford protection to fan bearings, motor and drive as shown below.

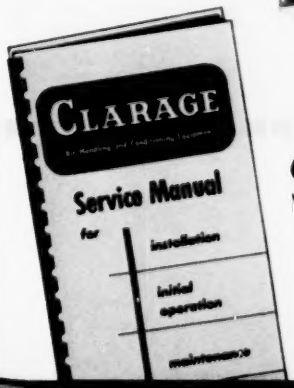
OUTDOOR JOBS

Cut below shows Ready Unit equipped with (easily removable) Outdoor Covers shielding all working parts from rain and snow.

LARGER SIZES



Cut at left shows standard Ready Unit as built in three largest sizes. These larger units, too, can be equipped with Outdoor Covers.



68 PAGES OF VALUABLE INFORMATION

New Manual shows how to properly install and service Clarage fans, blowers and air conditioning units . . . valuable information adaptable to almost any type of fan job. Sent without charge to factory executives, engineers and maintenance officials.

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of All-Weather Comfort

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Automatic

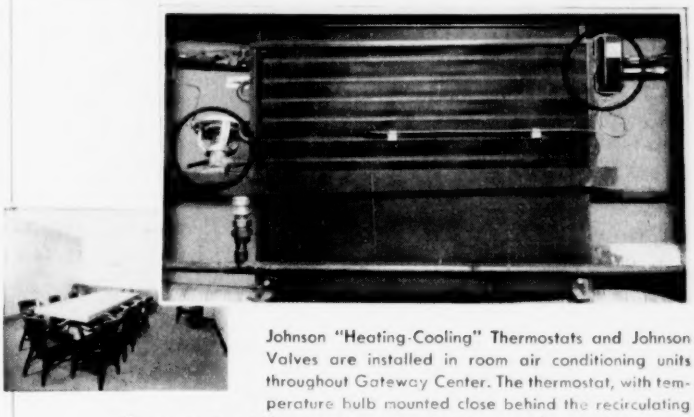
CONTROL

Equitable Life Assurance Society's Gateway Center, Pittsburgh
Architects—Eggers and Higgins, New York, and Irwin Clavan, New York
Consulting Engineers—Meyer, Strong and Jones, New York
Builder—Starrett Bros. and Eken, New York
Air Conditioning Contractors—Kerby Saunders, Inc., New York

Gateway Center, crown jewel of Pittsburgh's fabulous Golden Triangle, is acclaimed everywhere as a triumph of advanced design, engineering skill and farsighted enterprise. In its creation, perfection was the only standard.

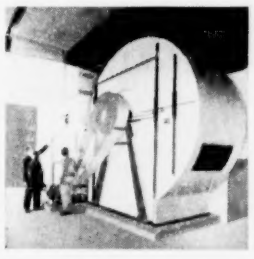
For example, with Johnson Control in command of the air conditioning system, there is automatic comfort control every minute of the day for the 8,000 people who will occupy these modern buildings. In each bay or private office on the periphery, a Johnson "Heating-Cooling" Thermostat permits individual weather selection by the occupants. Nearly 2,000 Thermostats and more than 5,900 Johnson Valves, regulating the supply of hot and cold water in modern Carrier Weathermaster room air conditioning units, assure complete year 'round personal comfort for each occupant.

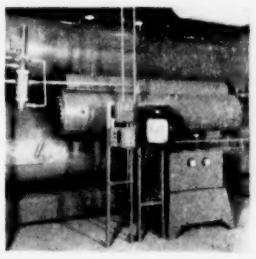
In addition to *individual room temperature control*, behind the scenes there is Johnson Master-Submaster Control to operate valves and dampers to regulate temperatures and humidities of the air supplied by the primary and central air conditioning systems serving the individual room units and the interior zones of the buildings. In the basement areas, other Johnson instruments operate valves and dampers on unit ventilators and exhaust fans.



Johnson "Heating-Cooling" Thermostats and Johnson Valves are installed in room air conditioning units throughout Gateway Center. The thermostat, with temperature bulb mounted close behind the recirculating grille, responds quickly to average room temperature. In turn, the Johnson valve regulates the hot and cold water supply to the coil of the unit and automatically applies exactly the right heating or cooling effect.

Gateway Center, involving one of the world's largest automatic air conditioning control systems, is another convincing demonstration that *any* control problem is best solved by Johnson . . . the only nationwide organization devoted exclusively to planning, manufacturing and installing automatic temperature and air conditioning control systems. Ask a Johnson engineer from a nearby branch office for recommendations on any control problem—large or small, in both new and existing buildings. There is no obligation. JOHNSON SERVICE COMPANY, Milwaukee 2, Wisconsin. Direct Branch Offices in Principal Cities.





At left above, J. S. McCorkle, chief engineer of Gateway Center, points to Johnson Humidostat and Johnson Piston Damper Operators on this typical fan installation serving an interior zone of one building. A Johnson Humidostat measures and automatically controls the humidity of the spaces.

At right above is one of three 1500 ton Carrier centrifugal refrigerating machines that furnish chilled water for air conditioning. A Johnson Record-O-Stat (2-pen type) measures and records temperatures of both inlet water and water leaving the chiller. The temperature of the water leaving the chiller is automatically controlled by the Record-O-Stat, which operates the suction dampers of the huge machine.

JOHNSON *Automatic Temperature and Air Conditioning* **CONTROL**

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